Multiple Choice

1. An expression is given. Evaluate it at the given value
$-x^4+x^3+8x, \quad x=-1$
(A) –10 (B) 9 (C) 9 (D) 10 (E) –12

2. Simplify the expression. $\dfrac{x-2}{x^2-4}$
(A) $x+2$ (B) $\dfrac{1}{x+2}$ (C) $\dfrac{1}{x-2}$
(D) $\dfrac{1}{x+4}$ (E) $\dfrac{1}{x-4}$

3. Simplify the expression. $\dfrac{x^3+7x^2+10x}{x^2+8x+15}$
(A) $\dfrac{x+2}{x+3}$ (B) $\dfrac{x(x+2)}{x+3}$ (C) $\dfrac{x+2}{x(x+3)}$
(D) $x(x+2)$ (E) $\dfrac{x(x+3)}{x+2}$

4. Simplify the expression. $\dfrac{2y^2-5y-7}{4y^2-49}\div\dfrac{y^2-6y-7}{2y^2-7y-49}$
(A) 1 (B) $\dfrac{1}{y-1}$ (C) $\dfrac{1}{2y-7}$
(D) $\dfrac{1}{y-7}$ (E) $2y-1$

5. Simplify the expression. $\dfrac{x}{x^2-6x-27}-\dfrac{4}{x+3}-\dfrac{6}{x-9}$
(A) $\dfrac{18+9x}{(x-3)(x+9)}$ (B) $\dfrac{18-9x^2}{(x+3)(x-9)}$
(C) $\dfrac{18-9x}{(x+3)(x-9)}$ (D) $\dfrac{18-9x}{(x-3)(x+9)}$
(E) $\dfrac{18-9x}{x-9}$

6. Simplify the expression. $\dfrac{1}{x+3}-\dfrac{1}{(x+3)^2}+\dfrac{9}{x^2-9}$
(A) $\dfrac{x^2+8x+21}{(x+3)^2(x-3)^2}$ (B) $\dfrac{x^2+8x+21}{(x+3)^2+(x-3)}$
(C) $\dfrac{x^2+8x+21}{(x+3)^2(x-3)}$ (D) $\dfrac{x^2+8x+21}{(x+3)(x-3)^2}$
(E) $\dfrac{x^2-8x-21}{(x+3)^2(x-3)}$

7. Express the function in the form $f\circ g$.
$H(x)=\sqrt{4+\sqrt{x}}$
A) $f(x)=\sqrt{x}$, $g(x)=\sqrt{4+x}$
B) $f(x)=\sqrt{4+x}$, $g(x)=\sqrt{x}$
C) $f(x)=\sqrt{4-x}$, $g(x)=x^2$
D) $f(x)=\sqrt{x}$, $g(x)=\sqrt{4-x}$
E) $f(x)=\sqrt{x-4}$, $g(x)=\sqrt{x}$

8. Express the function in the form $f\circ g\circ h$.
$j(x)=\dfrac{4}{\left(7+\sqrt{x}\right)^6}$
(A) $f(x)=\dfrac{4}{x^6}$, $g(x)=7+x$, $h(x)=\sqrt{x}$
(B) $f(x)=\sqrt{x}$, $g(x)=\dfrac{4}{x^6}$, $h(x)=7+x$
(C) $f(x)=7+x$, $g(x)=\sqrt{x}$, $h(x)=\dfrac{4}{x^6}$
(D) $f(x)=7+x$, $g(x)=\dfrac{4}{x^6}$, $h(x)=\sqrt{x}$

9. Find the domain of $g\circ f$, if $f(x)=x^2$ and $g(x)=\sqrt{x-20}$.
(A) $\left(-\infty,-\sqrt{20}\right]\left[\sqrt{20},\infty\right)$
(B) $\left[\sqrt{20},\infty\right)$
(C) $\left(-\infty,-\sqrt{20}\right)\left(\sqrt{20},\infty\right)$
(D) $(-\infty,-20][20,\infty)$

10. Simplify the expression. $\sqrt{1+\left(\dfrac{x}{\sqrt{9-x^2}}\right)^2}$
(A) $\dfrac{3}{9-x^2}$ (B) $\dfrac{3}{\sqrt[3]{9-x^2}}$ (C) $\dfrac{3}{\sqrt[4]{9-x^2}}$
(D) $\dfrac{3}{\sqrt{9-x^2}}$ (E) $\dfrac{1}{9-x^2}$

11. Determine whether the given value is a solution of the equation. $\dfrac{1}{x}-\dfrac{1}{x-8}=\dfrac{1}{2}, \quad x=4$
(A) yes (B) no

12. Solve the equation. $-4w+32=-8w$
(A) 8 (B) 32 (C) 9 (D) –8 (E) –9

13. Solve the equation. $\dfrac{z}{9}=\dfrac{6}{63}z+7$
(A) –49 (B) 7 (C) 6 (D) 63 (E) 441

14. Solve the equation. $x-\dfrac{1}{12}x-\dfrac{1}{2}x-\dfrac{80}{24}=0$
(A) 8 (B) 6 (C) –6 (D) –8 (E) 9

15. Solve the equation. $\dfrac{4}{x-6}+\dfrac{12}{x+6}=\dfrac{144}{x^2-36}$
(A) 6 (B) 4 (C) –6 (D) 36 (E) 12

16. Solve the equation. $(t-5)^2=(t+5)^2+160$
(A) –5 (B) 5 (C) –8 (D) 8 (E) –32

17. Find all real solutions of the equation.
$2x^2+7x-4=0$
(A) none of these (B) $x=-\dfrac{1}{2}, 4$
(C) $x=\dfrac{3}{2}, -1$ (D) $x=\dfrac{1}{2}, -4$ (E) $x=-\dfrac{1}{2}, -4$

18. Find all real solutions of the equation.
$\sqrt{4x+16}+4=x$
(A) 4, 0 (B) 0 (C) –12
(D) 0, 12 (E) 12

19. Find all real solutions of the equation.
$\sqrt{\sqrt{x+2}+x}=2$
(A) $x = 6$ (B) $x = –7, x = 2$ (C) $x = 7, x = 2$
(D) $x = –14, x = –5$ (E) $x = 2$

20. Solve the linear inequality. Express the solution using interval notation. $3(5x-2)\le 12x+27$
A) $(-\infty,13]$ B) $(-\infty,11]$ C) $(-\infty,10]$
D) $(-\infty,14]$ E) $(-\infty,12]$

21. Solve the nonlinear inequality. Express the solution using interval notation. $x^2-2x-24\le 0$
A) $(-\infty,-5)[8,\infty)$ B) $(-\infty,-5][8,\infty)$
C) $[-5,8]$ D) $[-4,6]$ E) $(-\infty,-6)[4,\infty)$

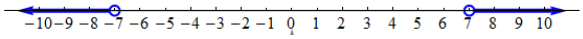
22. Solve the nonlinear inequality. Express the solution using interval notation. $\frac{3x+1}{x-4}\le 4$
A) $(-\infty,4)[19,\infty)$ B) $(-\infty,4)[18,\infty)$
C) $(-\infty,4)[17,\infty)$ D) $(-\infty,4)[15,\infty)$
E) $(-\infty,4)[16,\infty)$

23. A riverboat theater offers bus tours to groups on the following basis. Hiring the bus costs the group $300, to be shared equally by the group members. Theater tickets, normally $30 each, are discounted by 25 cents times the number of people in the group. How many members must be in the group so that the cost of the theater tour (bus fare plus theater ticket) is less than $40 per person?
A. at least 16 members B. at least 21 members
C. at least 12 members D. at least 20 members
E. at least 32 members

24. Solve the inequality. Express the solution using interval notation. $0<11-5x$
A) $\left[\frac{14}{5},\infty\right)$ B) $\left(\frac{14}{5},\infty\right)$ C) $\left(-\infty,\frac{11}{5}\right]$
D) $\left(-\infty,\frac{14}{5}\right)$ E) $\left(-\infty,\frac{11}{5}\right)$

25. Solve the inequality. Express the solution using interval notation. $3\le x+9<6$
A) [–8, –6) B) [2, 7) C) [3, 6)
D) [–6, –3) E) [–7, –2)

26. Solve the inequality. Express the answer using interval notation. $|x+9|\ge 6$
A) $\varnothing$ B) [–15, –3] C) $[-3,\infty)$
D) $(-\infty,-15][-3,\infty)$ E) $(-\infty,-15)(-3,\infty)$

27. A set of real numbers is graphed. Find an inequality involving an absolute value that describes the set.


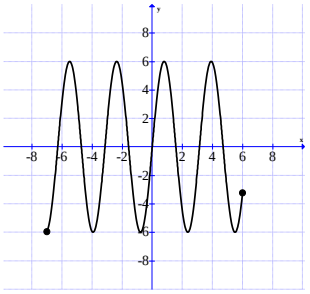
A) $|x|>7$ B) $|x-6|<7$ C) $|x|\ge 7$
D) $|x|\le 7$ E) $|x|<7$

28. Solve the nonlinear inequality. Express the solution using interval notation and graph the solution set.
$\frac{x}{x+1}>3x$
A) $(-\infty,-1)(0,\infty)$ B) $(-\infty,-1)\left(-\frac{2}{3},0\right)$
C) $(-\infty,-1)\left(-\frac{2}{3},\infty\right)$ D) $(-1,0)\left(\frac{2}{3},\infty\right)$

29. Evaluate the function $f(x)=x^2+6x$ at $f(8)$.
A) $f(8) = 56$ B) $f(8) = 16$ C) $f(8) = 112$
D) $f(8) = 72$ E) $f(8) = 120$

30. Evaluate the function $f(x)=\frac{13-x}{-1+x}$ at $f(5)$.
A) $f(5) = 1.5$ B) $f(5) = 1.75$ C) $f(5) = 2.25$
D) $f(5) = 1.25$ E) $f(5) = 2$

31. Find the domain of the following function:
$f(x)=\sqrt[9]{x-4}$
A) (-∞, ∞) B) [0, ∞) C) (0, ∞)
D) [4, ∞) E) (-∞, 4]

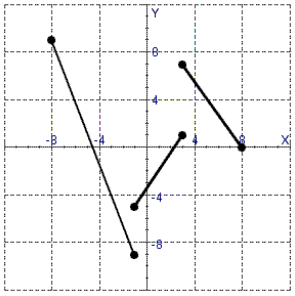
32. What is the domain and range of the function that is graphed below?


(A) Domain: (–7, 6), Range: [–6, 6]
(B) Domain: (-∞, ∞), Range: [–6, 6]
(C) Domain: [–7, 6], Range: [–6, 6]
(D) Domain: [–7, 6], Range: (-∞, ∞)
(E) Domain: [–6, 6], Range: [–7, 6]

33. What is the average rate of change of the function $f(x)=x^3-2x^2$ between $x = 0$ and $x = 8$?
A) 44 B) 47 C) 48 D) 46 E) 41

34. What is the average rate of change of the function $f(x)=x+x^2$ between $x = 0$ and $x = 5$?
A) 6 B) 7 C) 10 D) 8 E) 5

35. The graph of the function is sketched as follows:



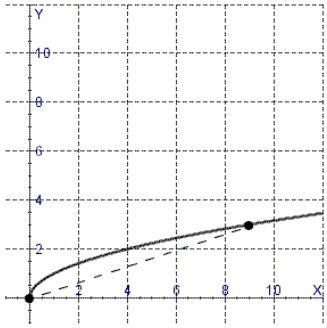
Determine the interval on which the function is increasing.

A) (–1, –8)
B) (3, 8)
C) (–8, –1)
D) (–1, 3)
E) (3, –2)

36. How many units must we shift the graph of $f(x)=2(x+8)^4$ to obtain the graph of $f(x)=2(x+12)^4$?

A) 3 left
B) 4 left
C) 4 right
D) 2 right
E) 8 left

37. The graph of a function is given as follows:

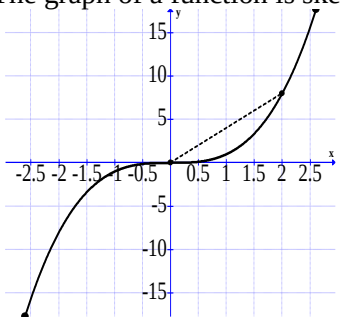


Determine the average rate of change for the function between the indicated values of the variable.

A) $-\frac{1}{2}$ B) $-\frac{1}{3}$

C) $\frac{1}{2}$ D) $\frac{1}{3}$

38. The graph of a function is sketched as follows:



Determine the average rate of change of the function between the indicated values.

A) 2 B) –2 C) 4

D) –4 E) $-\frac{1}{4}$

39. The table shows the number of CD players sold in a small electronics store in the years 1989 - 1999 as follows:

Year	CD players sold
1989	545
1990	675
1991	665
1992	665
1993	600
1994	550
1995	680
1996	560
1997	545
1998	560
1999	695

What was the average rate of change of sales between 1989 and 1999?

(A) 70 CD players/year
(B) 695 CD players/year
(C) 150 CD players/year
(D) 15 CD players/year
(E) 37.5 CD players/year

40. Suppose the graph of f is given. Describe how the graph of the function can be obtained from the graph of f. $y=4f(x+5)-3$

(A) Shift the graph of $y=f(x)$ to the right 4 units, stretch vertically by a factor of 5, and then shift downward 3 units.
(B) Shift the graph of $y=f(x)$ to the left 4 units, stretch vertically by a factor of 5, and then shift downward 3 units.
(C) Shift the graph of $y=f(x)$ to the right 5 units, stretch vertically by a factor of 4, and then shift downward 3 units.
(D) Shift the graph of $y=f(x)$ to the left 5 units, stretch vertically by a factor of 4, and then shift upward 3 units.
(E) Shift the graph of $y=f(x)$ to the left 5 units, stretch vertically by a factor of 4, and then shift downward 3 units.

41. The population of a certain species of bird is limited by the type of habitat required for nesting. The population behaves according to the *logistic growth model* $n(t)=\frac{2500}{1+105e^{-0.385t}}$ where t is measured in years. What size does the population approach as time goes on?

A) 500 B) 100 C) 7500
D) 2500 E) 5000

42. If $1,000 is invested at an interest rate of 10% per year, compounded monthly, which equation will find the amount of the investment at the end of 4 years.

A) $A=1000\left(1+\frac{0.10}{12}\right)^4$

B) $A=1000\left(1+\frac{0.10}{12}\right)^{48}$

C) $A=1000\left(1+\frac{0.10}{12}\right)^{12}$

D) $A=1000e^{4.8}$

43. Solve the equation. $e^{2x}-5e^x+4=0$

A) $x=-4, x=1$ B) $x=\ln 4$ C) $x=0$
D) $x=\ln 4, x=0$ E) $x=4, x=1$

44. Solve the logarithmic equation for *x*.
$log_2 2 + log_2 x = log_2 3 + log_2 (x-5)$

A) $x = 15$ B) $x = 3.9$ C) $x = 17$
D) $x = 30$ E) $x = 12$

45. Solve the inequality. $x^2 e^x - 16e^x < 0$

A) 0, 4) B) (-16, 16) C) (-4, 0)
D) (-4, 4) E) (-4, 16)

46. Which equation will find the time required for an investment of $3,000 to grow to $8,000 at an interest rate of 8% per year, compounded quarterly.

A) $8000 = 3000\left(1+\frac{0.08}{12}\right)^{12t}$

B) $8000 = 3000\left(1+\frac{0.08}{4}\right)^{4t}$

C) $3000 = 8000\left(1+\frac{0.08}{4}\right)^{4t}$

D) $8000 = 3000e^{4t}$

47. A sum of $3,000 was invested for 4 years, and the interest was compounded semiannually. If this sum amounted to $5,000 in the given time, which equation will find the interest rate?

A) $5000 = 3000\left(1+\frac{r}{2}\right)^{8}$

B) $5000 = 3000\left(1+\frac{r}{12}\right)^{48}$

C) $5000 = 3000\left(1+\frac{r}{2}\right)^{4}$

D) $5000 = 3000e^{0.32}$

48. The population of a certain city was 118,000 in 1994, and the observed relative growth rate is 3% per year. Which equation will find the year the population reach 219,000?

A) $219000 = 118000\left(1+\frac{0.03}{1}\right)^{t}$

B) $219000 = 118000e^{(ln(1.03))t}$

C) $219000 = 118000e^{0.03t}$

D) $219000 = 118000e^{(ln(219/118))t}$

49. Radium-221 has a half-life of 30 s. How long will it take for 95% of a sample to decay?

A) $0.05 = 1e^{(2ln(1/2))t}$

B) $0.95 = 1e^{(2ln(1/2))t}$

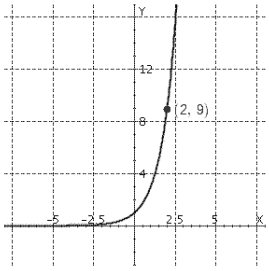
C) $0.5 = 1e^{(1/2)t}$

D) $0.05 = 1e^{(ln 2)t}$

50. State the range of the function. $h(x) = 2 + \left(\frac{1}{7}\right)^x$

A) $(0, \infty)$ B) $(-2, \infty)$ C) $(-\infty, \infty)$
D) $(2, \infty)$ E) $(-2, 2)$

51. Find the exponential function $f(x) = a^x$ whose graph is given.



A) $f(x) = 3^x$
B) $f(x) = 3^{x+3}$
C) $f(x) = -3^x$
D) $f(x) = 3^{-x}$
E) $f(x) = x^3$

52. State the range of the function $y = 8 - e^x$.

A) $(-8, \infty)$ B) $(-\infty, 8)$ C) $(-\infty, \infty)$
D) $[8, \infty)$ E) $(0, \infty)$

53. What is the asymptote of the function $y = e^{x-2} + 3$?

A) $x = 2$ B) $y = 3$ C) $y < 3$
D) $y = 2$ E) $x > 2$

54. Express the equation $ln(x+1) = 4$ in exponential form.

A) $x = e^1 - 4$ B) $x = e^4 - 1$ C) $x = e^1 + 4$
D) $x = e^4 + 1$ E) none of these

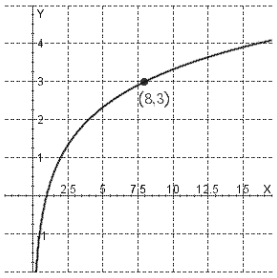
55. Express the equation in logarithmic form. $3^4 = 81$

A) none of these B) $log_4 3 = 81$ C) $log_3 81 = 4$
D) $log_4 81 = 3$ E) $log_{81} 3 = 4$

56. Evaluate the expression. $e^{ln 5}$

A) $5e$ B) none of these C) $ln\, 5$
D) 5 E) e^5

57. Find the function of the form $y = log_a x$ whose graph is given.



A) $y = log_5 x$
B) $y = log_2 x$
C) $y = log_8 x$
D) $y = log_3 x$
E) none of these

58. Use the Laws of Logarithms to rewrite the expression below in a form with no logarithm of a product, quotient, or power. $log_a\left(\frac{x^2}{yz^7}\right)$

(A) $-2\ log_a x + log_a y + 7\ log_a z$
(B) $\frac{2 log_a x}{log_a (7y) log_a z}$
(C) $2\ log_a x - log_a y - 7\ log_a z$
(D) $2\ log_a x + log_a y + 7\ log_a z$
(E) $2\ log_a x - log_a y + 7\ log_a z$

59. Use the Laws of Logarithms to rewrite the expression below in a form with no logarithm of a product, quotient, or power. $ln\left(x\sqrt[9]{\frac{y}{z}}\right)$

A) $ln\,x+\frac{1}{9}ln\,y+\frac{1}{9}ln\,z$ B) $ln\,x+\frac{1}{9}ln\,y-\frac{1}{9}ln\,z$

C) $ln\,x-\frac{1}{9}ln\,y-\frac{1}{9}ln\,z$ D) $ln\,x-\frac{1}{9}ln\,y+\frac{1}{9}ln\,z$

60. Use the Laws of Logarithms to rewrite the expression below in a form with no logarithm of a product, quotient, or power. $log\sqrt[6]{x\sqrt[6]{y\sqrt[6]{z}}}$

A) $\frac{1}{216}log\,x+\frac{1}{36}log\,y+\frac{1}{6}log\,z$

B) $\frac{1}{216}\left(log\,x+log\,y+log\,z\right)$

C) $\frac{1}{6}log\,x+\frac{1}{36}log\,y+\frac{1}{216}log\,z$

D) $\frac{1}{216}log\,x-\frac{1}{36}log\,y-\frac{1}{6}log\,z$

61. Rewrite the expression as a single logarithm. $log_3 2+2log_3 2$

A) $log_3 8$ B) $log_8 3$ C) $log_3 4$

D) 1 E) $\frac{ln 8}{}$

62. Rewrite the expression below as a single logarithm. $log\,14+\frac{1}{2}log\,3-log\,2$

A) $ln 3\sqrt{7}$ B) $log\frac{1}{3}\sqrt{7}$ C) $log\frac{1}{7}\sqrt{3}$

D) $log\,21$ E) $log\,7\sqrt{3}$

63. Solve the equation. $e^{2x}-5e^{x}+4=0$

A) $x = –4, x = 1$ B) $x = ln\ 5$

C) $x = ln\ 5, x = 0$ D) $x = 4, x = 1$

E) $x = ln\ 4, x = 0$

64. Solve the logarithmic equation for x. $log\left(8x+6\right)=2$

A) $x=\frac{47}{3}$ B) $x=\frac{47}{4}$ C) $x=\frac{95}{8}$

D) none of these E) $x=\frac{47}{8}$

65. Solve the logarithmic equation for x. $log_2 2+log_2 x=log_2 3+log_2\left(x-5\right)$

A) $x = 15$ B) $x = 3.9$ C) $x = 17$

D) $x = 30$ E) $x = 12$

66. Find the sum. $\sum_{i=2}^{18}4i$

A) 720 B) 40 C) 170 D) 560 E) 680

67. Write the following sum. $\sum_{k=5}^{7}k\left(k+9\right)$

A) $5\left(5+9\right)+6\left(6+9\right)+8\left(8+9\right)$

B) $5\left(5+9\right)+7\left(7+9\right)$

C) $6\left(6+9\right)+7\left(7+9\right)+8\left(8+9\right)$

D) $5\left(5+9\right)+6\left(6+9\right)+7\left(7+9\right)$

E) $6\left(6+9\right)+7\left(7+9\right)$

68. Find the common difference d of the arithmetic sequence. 4, 6, 8, 10, ...

A) 6 B) n C) 4 D) 2 E) $2n$

69. Find the partial sum S_n of the arithmetic sequence that satisfies the following conditions. $a_1 = 3$, $d = 5$, $n = 20$

A) 103
B) 2020
C) 1010
D) 98
E) 1060

70. A partial sum of an arithmetic sequence is given. Find the sum. $-3+\left(-\frac{3}{2}\right)+0+\frac{3}{2}+...+15$

A) 78 B) 42 C) 12 D) 60 E) 97.5

71. An architect designs a theater with 25 seats in the first row, 29 in the second, 33 in the third, and so on. If the theater is to have a seating capacity of 4,120, how many rows must the architect use in his design?

A) 50 B) 42 C) 40 D) 45 E) 35

72. Determine whether the sequence is geometric. 8, –4, 2, –1, ... If it is geometric, find the common ratio.

A) Geometric, $-\frac{1}{2}$ B) Geometric, –2

C) Geometric, 2 D) Geometric, $\frac{1}{2}$

E) Not geometric.

73. Find the first five terms of the sequence and determine if it is geometric. If it is geometric, find the common ratio. $a_n = 6\left(2\right)^n$

A) 12, 24, 48, 96, 192; $r = 2$
B) 12, 24, 48, 96, 194; $r = 3$
C) 12, 24, 48, 96, 192; it is not geometric.
D) 12, 24, 48, 96, 192; $r = 3$
E) 12, 24, 48, 96, 194; $r = 2$

74. The common ratio in a geometric sequence is $\frac{5}{4}$, and the fourth term is $\frac{7}{4}$. Find the third term.

A) $\frac{2}{5}$ B) $\frac{14}{5}$ C) $\frac{5}{7}$ D) $\frac{7}{5}$ E) $\frac{6}{4}$

75. Find the sum of the infinite geometric series.
$1+\frac{1}{3}+\frac{1}{9}+\frac{1}{27}+....$

A) 2 B) $\frac{2}{3}$ C) $\frac{3}{2}$ D) $\frac{5}{4}$ E) 1

76. Use Pascal's triangle to expand the expression $\left(x+\frac{3}{x}\right)^4$.

A) $x^4+4x^2+9+\frac{108}{x^2}+\frac{81}{x^4}$

B) $x^4+36x^2+9+\frac{108}{x^2}+\frac{81}{x^4}$

C) $x^4+6x^2+18+\frac{54}{x^2}+\frac{81}{x^4}$

D) $x^4+6x^2+54+\frac{18}{x^2}+\frac{81}{x^4}$

E) $x^4+12x^2+54+\frac{108}{x^2}+\frac{81}{x^4}$

77. Use Pascal's triangle to expand the expression $(x-3)^5$.

A) $x^5-15x^4+30x^3+270x^2+405x-243$
B) $x^5-15x^4+72x^3-216x^2+405x-243$
C) $x^5-15x^4-100x^3+270x^2+405x-243$
D) $x^5-15x^4+90x^3+270x^2-405x-243$
E) $x^5-15x^4+90x^3-270x^2+405x-243$

78. Use Pascal's triangle to expand the expression $\left(x^5y^7-1\right)^5$.

A) $x^{25}y^{35}+5x^{20}y^{28}-10x^{15}y^{21}-10x^{10}y^{14}+5x^5y^7-1$
B) $x^{25}y^{35}-5x^{20}y^{28}+8x^{15}y^{21}-10x^{10}y^{14}+5x^5y^7-1$
C) $x^{25}y^{35}+4x^{20}y^{28}-8x^{15}y^{21}-8x^{10}y^{14}+4x^5y^7-1$
D) $x^{25}y^{35}-5x^{20}y^{28}+10x^{15}y^{21}-10x^{10}y^{14}+5x^5y^7-1$
E) $x^{25}y^{35}-5x^{20}y^{28}+10x^{15}y^{21}-10x^{10}y^{14}-2x^5y^7-1$

79. Evaluate the expression $\binom{10}{4}$.

A) 5,042 B) 210 C) 5,040
D) 2,310 E) 216

80. Find the 18th term in the expansion of $(A-B)^{21}$.

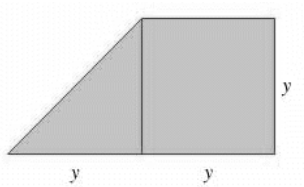
A) $-5{,}985A^4B^{17}$ B) $-333A^4B^{17}$
C) $-1{,}330A^5B^{17}$ D) $-210A^2B^{19}$
E) $-23{,}940A^3B^{18}$

Short Answer

81. Perform the addition and simplify. $\frac{1}{x+5}+\frac{1}{x^2-25}$

82. Perform the subtraction and simplify.
$\frac{x}{x^2-x-20}-\frac{1}{x+4}-\frac{3}{x-5}$

83. Find the length y in the figure, if the shaded area is 96 in^2.



84. Perform the multiplication and simplify.
$\frac{x^2-3x-40}{x^2-25}\cdot\frac{5+x}{8-x}$

85. Determine whether the given value is a solution of the equation.
$\frac{x^{5/2}}{x-6}=x-20$
(A) $x = 8$ (B) $x = 4$

86. Solve the equation. $4t-10=18-4t$

87. Solve the equation by factoring. $2y^2+5y+2=0$

88. Solve the equation by completing the square.
$x^2=\frac{3}{5}x-\frac{2}{25}$

89. Find all real solutions of the equation. $|3x|=7$

90. Simplify $(5ab)^4$

91. Simplify $\left(\frac{20t^3}{10s^4}\right)^2$

92. Simplify: $\left(6x^7-8x^6-12\right)-\left(3x^7+6x^6+2\right)$

93. Simplify:
$\left(1.3x^3+7.2x^2+4.8\right)+\left(6.3x-2.6\right)-\left(3.1x^2-x-9.4\right)$

94. Multiply: $(2y-1)(3y+10)$

95. Multiply: $(x-5)\left(x^2+5x+25\right)$

96. Factor: $120m^9-24m^7+60m^2$

97. Factor: $x(y+11)+9(y+11)$

98. Factor: $10y^2-23y+12$

99. Factor: x^4-625

100. Factor: $x^2-\frac{1}{16}$

101. Multiply: $5y^2\left(5y^2+2y-3\right)$

102. Simplify each radical and combine if possible:
$2\sqrt{8}-4\sqrt{72}$

103. Simplify each radical and combine if possible: $\sqrt{20}+\sqrt{405}$

104. Simplify each radical and combine if possible: $\sqrt{75xy^6}\cdot\sqrt{3x^2y^6}$

105. Rationalize and simplify: $\dfrac{3}{\sqrt{2}}$

106. Rationalize and simplify: $\sqrt{\dfrac{10}{x}}$

107. Simplify: $125^{2/3}$

108. Simplify: $\left(\dfrac{8}{27}\right)^{2/3}$

109. Simplify: $9^{-3/2}$

110. If $f(x)=x^2-4$, determine the graph of $w(x)=|x^2-4|$?

111. Find the domain of the function. $g(x)=\sqrt{8-x}+3$

112. Sketch the graph of the piecewise defined function.
$$f(x)=\begin{cases}2 & \text{if} \quad x<-2\\ -x & \text{if} \quad -2\le x\le 2\\ -2 & \text{if} \quad x>2\end{cases}$$

113. Sketch the graph of the piecewise defined function.
$$f(x)=\begin{cases}-2x^2 & \text{if} \quad |x|\le 1\\ -2 & \text{if} \quad |x|>1\end{cases}$$

114. A man is running around a circular track 200 m in circumference. An observer uses a stopwatch to record the runner's time at the end of each lap, obtaining the data in the table.

Time (s)	Distance (m)
32	200
66	400
104	600
153	800
209	1000
270	1200
341	1400
419	1600

(a) What was the man's average speed (rate) between 66 s and 153 s? Please round your answer to the nearest hundredth.

(b) What was the man's average speed (rate) between 270 s and 419 s? Please round your answer to the nearest hundredth.

For the following, graph, determine the domain and range, and determine where the graph is increasing.

115. $f(x)=x^2-3$

116. $f(x)=\dfrac{1}{x-2}$

117. $f(x)=-\sqrt{6-x}$

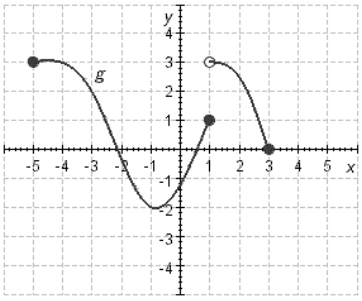
118. $f(x)=(x-1)^3+2$

119. $f(x)=\dfrac{1}{(x-3)^2}+1$

120. $f(x)=\sqrt[3]{2x-6}-1$

121. $f(x)=-|x+2|-1$

122. Determine where the function is increasing.



123. A function is given. Determine the average rate of change of the function between the values of the variable. $g(x)=\dfrac{2}{x+1}$; $x=0,\ x=h$

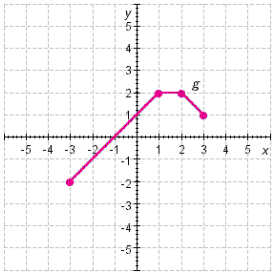
124. Evaluate the following piecewise defined function at $f(1)$, $f(3)$, and $f(7)$.
$$f(x)=\begin{cases}1 & \text{if} \quad x<3\\ 8x-6 & \text{if} \quad x\ge 3\end{cases}$$

125. Use the function $f(x)=x^2+1$ to evaluate the following expressions and simplify. $f(a+5)$

126. For the function $f(x)=4x^3$, find $\dfrac{f(a+h)-f(a)}{h}$.

127. Find the domain of the function. $h(x)=\sqrt{8x-7}$

128. The graph of g is given. Sketch the graph of the function. $y=g(x)-2$



129. In a certain country, income tax T is assessed according to the following function of income x.
$$T(x)=\begin{cases}0 & \text{if} \quad 0\le x\le 10{,}000\\ 0.1x & \text{if} \quad 10{,}000<x\le 20{,}000\\ 1{,}800+0.12x & \text{if} \quad 20{,}000<x\end{cases}$$
(A) Find T(3,000). (B) Find T(15,000).
(C) Find T(30,000).

130. Assume f is a one-to-one function. If $f(x)=3-6x$, find $f^{-1}(33)$.

131. Use $f(x)=2x-8$ and $g(x)=4-x^2$ to evaluate $f(g(-1))$.

132. Find the inverse function of $f(x)=\dfrac{2-7x}{9-5x}$.

133. Find the inverse function of $f(x)=7+\sqrt[3]{x}$.

134. Find the maximum or minimum value of the function. $f(t) = 7t^2 + 14t + 101$

135. Find the maximum or minimum value of the function. $g(x) = 4x^2 - 24x + 9$

136. A function *f* is given. $f(x) = \sqrt{x+5}$. Sketch the graph of *f*. Use the graph of *f* to sketch the graph of f^{-1}. Find f^{-1}.

137. A one-to-one function is given. $f(x) = 1 - \frac{1}{4}x$. Find the inverse of the function. Graph both the function and its inverse on the same screen to verify that the graphs are reflections of each other in the line $y = x$.

138. Find the coordinates of the function $y = x^2 - 2x$ vertex and its intercepts.

139. Find the coordinates of the function $y = x^2 - 6x + 8$ vertex and its intercepts.

140. Find its maximum or minimum value of the function $y = -x^2 + 8x$:

141. Find its maximum or minimum value of the function $y = x^2 - 4x + 7$:

142. Find the domain and range of the function $f(x) = x^2 - 12x + 2$

143. If a ball is thrown directly upward with a velocity of 80 ft/s, its height (in feet) after *t* seconds is given by $y = 80t - 16t^2$. What is the maximum height attained by the ball?

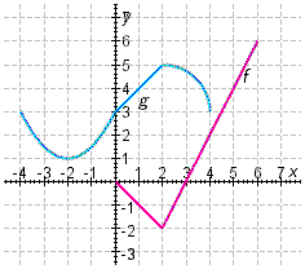
144. A quadratic function is given. $f(x) = 3 + 8x - 2x^2$

Find the maximum or minimum value of the quadratic function *f*.

145. The number of apples produced by each tree in an apple orchard depends on how densely the trees are planted. If n trees are planted on an acre of land, then each tree produces $720 - 8n$ apples. So the number of apples produced per acre is $A(n) = n(720 - 8n)$.

How many trees should be planted per acre in order to obtain the maximum yield of apples?

146. Use the given graphs of *f* and *g* to evaluate the expression.



(A) $(g \circ f)(3) =$

(B) $(g \circ g)(-2) =$

147. A manufacturer finds that the revenue generated by selling *x* units of a certain commodity is given by the function $R(x) = 64x - 4x^2$, where the revenue *R*(*x*) is measured in dollars.

(a) What is the maximum revenue?

(b) How many units should be manufactured to obtain this maximum?

148. Find the function in general form whose graph is a parabola with vertex (3, 1) and that passes through the point (4, –5).

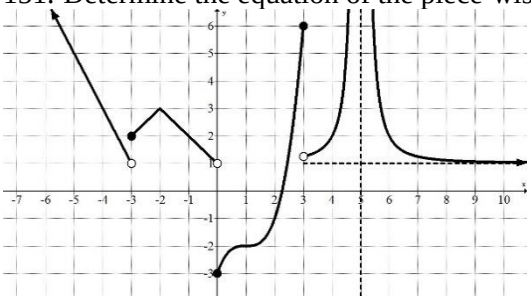
149. Use $f(x) = 2x - 5$ and $g(x) = 12 - x^2$ to evaluate the expression.

(A) $(f \circ f)(-1) =$ (B) $(g \circ g)(4) =$

150. Find the domain of the function.

$f(x) = \sqrt{x} + \sqrt{8 - x}$

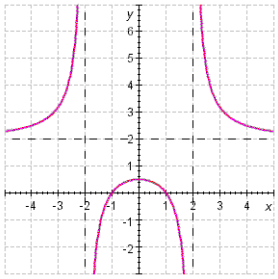
151. Determine the equation of the piece-wise function.



152. Graph the following function:

$$f(x) = \begin{cases} (x+5)^2 - 2, & x < -3 \\ \sqrt{1-x} + 1, & -3 \le x \le 1 \\ \dfrac{1}{x-3} - 2, & x > 1 \end{cases}$$

153. Determine the equation of the function whose graph is:



154. Find all asymptotes (if any). $r(x) = \dfrac{x^3 + 4x^2}{x^2 - 4}$

For problems 171-173, find the following:

(a) Determine the *x*-intercept(s).

(b) Determine the *y*-intercept(s).

(c) Determine the vertical asymptote(s).

(d) Determine the horizontal asymptote(s).

155. $s(x) = \dfrac{5x - 5}{(x-5)(x+1)}$

156. $r(x) = \dfrac{x^2 - 18x + 81}{x^2 + 6x + 9}$

157. $r(x) = \dfrac{3x^2 + 9}{x^2 - 2x - 3}$

Graph the following:

158. $r(x)=\dfrac{8x^3+2x}{x^2-4}$.

159. $s(x)=-\dfrac{3}{x+2}$

160. $r(x)=\dfrac{3x-11}{x-4}$

161. $r(x)=\dfrac{x-4}{x^2-9x}$.

162. $r(x)=\dfrac{5x^2+7}{x^2-2x-8}$

163. $f(x)=\dfrac{x^2+1}{x^2-1}$

164. $f(x)=\dfrac{x^2+1}{x}$

165. $f(x)=\dfrac{x^3+1}{x^2-1}$

166. $f(x)=\dfrac{2}{2x^2-x-3}$

167. $f(x)=\dfrac{x^2-4}{x^2-4x+4}$

168. $f(x)=\dfrac{4x-2}{x^2+5x-6}$

169. $f(x)=\dfrac{x-2}{x^2-2x-3}$

170. $f(x)=\dfrac{3x^2-12}{4-x^2}$

171. $f(x)=\dfrac{x^2-2x+3}{x+2}$

172. $f(x)=\dfrac{3x^2-x-4}{x^2-4}$

173. $f(x)=\dfrac{x^3-8}{x}$

174. $f(x)=\dfrac{2x^3+7x^2-4x}{x^2+2x-3}$

175. $f(x)=\dfrac{2x^2-4x-3}{x-2}$

176. $f(x)=\dfrac{x^2-4x-12}{x+2}$

177. Solve for *x*. $log\left(8x+6\right)=2$

178. Solve for *x*: $e^{x-3}=1+\sqrt{5}$.

179. A car dealer sells a used car for $18,000. He offers the buyer payments of $405 per month for 5 years. Write the equation that will find the interest rate the car dealer charging?

180. Write the equation that will find how much money should be invested monthly at 6% per year, compounded monthly, to have $2000 in 8 months?

181. If $3,000 is invested in an account for which interest is compounded quarterly, write the equation that will find the amount of the investment at the end of 3 years for 6%.

182. A sum of $4,000 is invested at an interest rate of 9% per year, compounded semiannually. Write the equation that will find the value $25,000 of the investment after *t* years.

183. Solve for *x*: $5^x=3^{x+2}$

184. Solve the equation. $x^2 2^x-2^x=0$

185. Solve the equation. $x^2 7^x-x7^x=6\left(7^x\right)$

186. State the range of the function. $h(x)=2+\left(\dfrac{1}{7}\right)^x$

187. State the range of the function $y=8-e^x$

188. Determine the domain and range of the function $h(x)=5-2^x$

189. Graph $f\left(x\right)=log_2\left(x-2\right)-2$.

190. Graph the function $y=11^{x+3}$. State the domain, range, and asymptote.

191. Graph $y=4^{x+2}$.

192. Use the definition of the logarithmic function to find *x*.
(a) $log_3 x=4$
(b) $log_{10}0.000001=x$

193. Find the domain of the function. $f\left(x\right)=log_8\left(x+3\right)$

194. Use the Laws of Logarithms to expand the expression. $log_3\left(AB^5\right)$

195. Use the Laws of Logarithms to expand the expression. $ln\dfrac{3x^5}{\left(x+1\right)^9}$

196. Use the Laws of Logarithms to collapse the expression. $5log\,x-\dfrac{1}{3}log\left(x^2+1\right)+4log\left(x-1\right)$

197. Use the Laws of Logarithms to collapse the expression. $2\left(log_3 x+2log_3 y-4log_3 z\right)$

198. Given that $log_7 a=4$ and $log_7 c=-5$, find the following:
A) $log_7 ac$
B) $log_7\dfrac{c}{a}$
C) $log_7 a^8$
D) $log_7\sqrt[4]{c}$

199. Determine the common difference, the fifth term, and the 100th term of the arithmetic sequence. 12, $12+s$, $12+2s$, $12+3s$, ...

200. Determine whether the sequence is geometric. If it is geometric, find the common ratio. 8, 4, 2, 1, ...

201. The common ratio in a geometric sequence is $\dfrac{5}{3}$, and the fifth term is 1. Find the first three terms.

202. A certain drug is administered once a day. The concentration of the drug in the patient's bloodstream increases rapidly at first, but each successive dose has less effect than the preceding one. The total amount of the drug (in mg) in the bloodstream after the *n*th dose is given by $\sum_{k=1}^{n}42\left(\dfrac{1}{4}\right)^{k-1}$.

(a) Find the amount of the drug in the bloodstream after *n* = 2 days. Please round your answer to four decimal places.

(b) If the drug is taken on a long-term basis, the amount in the bloodstream is approximated by the infinite series $\sum_{k=1}^{\infty}42\left(\dfrac{1}{4}\right)^{k-1}$. Find the sum of this series.

203. Use the Binomial Theorem to expand the expression. $\left(2A+B^2\right)^4$

204. Find the term containing x^4 in the expansion of $(x+2y)^{11}$

205. Find the partial sum S_7 of the sequence. 5, 10, 15, 20, ...

206. Find the partial sum S_5 of the sequence. 1, –1, 1, –1, ...

207. Find the *n*th term of the sequence. 2, 4, 8, 16, ...

Write out the first 4 terms

208. $a_n = 2^n$

209. $a_n = \dfrac{(-1)^n}{n^2}$

210. $a_n = \dfrac{n}{n+1}$

211. $a_n = \dfrac{n^2+1}{n!}$

Find the rule for the following:

212. 1, 4, 7, 10, ….

213. 2, -1, $\dfrac{1}{2}, -\dfrac{1}{4}, \ldots$

214. $\dfrac{1}{2\cdot 3}, \dfrac{2}{3\cdot 4}, \dfrac{3}{4\cdot 5}, \ldots$

215. $-\dfrac{1}{2}, \dfrac{1}{3}, -\dfrac{2}{9}, \dfrac{4}{27}, \ldots$

216. 1, 2, 6, 24, 120, …

Find the 42nd term.

217. $a_n = 2n-10$

218. $a_n = \dfrac{1+(-1)^n}{n}$

219. $a_n = \dfrac{2n!}{(n+1)!}$

220. $\dfrac{-1}{2}, 0, \dfrac{1}{4}, \dfrac{2}{5}, \ldots$

Find the sum of the following series, if possible.

221. $\sum_{n=1}^{10}(4n-5)$

222. $\sum_{n=3}^{5}(-1)^{n+2}(2n)$

223. $\sum_{n=1}^{\infty}3\left(\dfrac{3}{4}\right)^{n-1}$

224. $\sum_{n=1}^{\infty}2\left(-\dfrac{1}{5}\right)^{n}$

225. $2-1+\dfrac{1}{2}-\dfrac{1}{4}+\ldots$

226. 3 + 7 + 11 + 15 +…+ 79

227. $\sum_{n=1}^{30}(6n^3-2n^2-3n+7)$

228. $\sum_{n=4}^{19}(n^3-9n)$

Answer Section

1) A
2) B
3) B
4) A
5) C
6) C
7) B
8) A
9) A
10) D
11) A
12) D
13) E
14) A
15) E
16) C
17) D
18) E
19) E
20) B
21) D
22) C
23) B
24) E
25) D
26) D
27) A
28) B
29) C
30) E
31) A
32) C
33) C
34) A
35) D
36) B
37) D
38) C
39) D
40) E
41) D
42) B
43) D
44) A
45) D
46) B
47) A
48) B
49) A
50) D
51) A
52) B
53) B
54) B
55) C
56) D
57) B
58) C
59) B
60) C
61) A
62) E
63) E
64) B
65) A
66) 1. E
67) 2. D
68) 3. D
69) 4. C
70) 5. A
71) 6. C
72) 7. A
73) 8. A
74) 9. D
75) 10. C
76) 11. E
77) 12. E
78) 13. D
79) 14. B
80) 15. A

81) $\frac{x-4}{(x-5)(x+5)}$

82) $\frac{-3x-7}{(x-5)(x+4)}$

83) 8 in.

84) $\frac{5+x}{5-x}$

85) $x = 8$ is not a solution; $x = 4$ is a solution

86) $t = \frac{7}{2}$

87) $y = -2,\ y = -\frac{1}{2}$

88) $x = \frac{2}{5},\ x = \frac{1}{5}$

89) $x = -\frac{7}{3},\ x = \frac{7}{3}$

90) $625a^4b^4$

91) $\frac{4t^6}{s^8}$

92) $3x^7 - 14x^6 - 14$

93) $1.3x^3 + 4.1x^2 + 7.3x + 11.6$

94) $6y^2 + 17y - 10$

95) $x^3 - 125$

96) $12m^2\left(10m^7 - 2m^5 + 5\right)$

97) $(y+11)(x+9)$

98) $(2y-3)(5y-4)$

99) $\left(x^2+25\right)(x-5)(x+5)$

100) $\left(x-\frac{1}{4}\right)\left(x+\frac{1}{4}\right)$

101) $25y^4 + 10y^3 - 15y^2$

102) $-20\sqrt{2}$

103) $11\sqrt{5}$

104) $15xy^6\sqrt{x}$

105) $\frac{3\sqrt{2}}{2}$

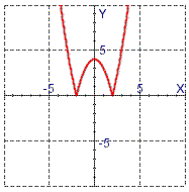
106) $\frac{\sqrt{10x}}{x}$

107) 25

108) $\frac{4}{9}$

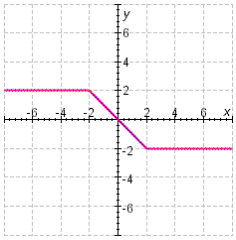
109) $\frac{1}{27}$

110)

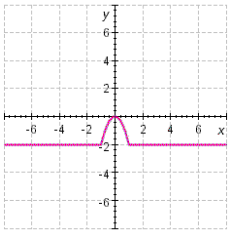


111) $(-\infty, 8]$

112)

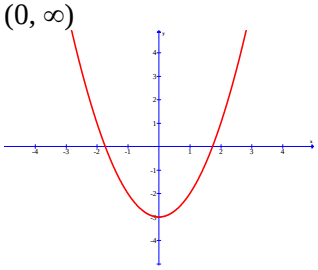


113)

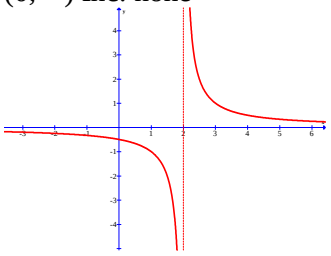


114) A) $\frac{400}{87}$ B) $\frac{400}{149}$

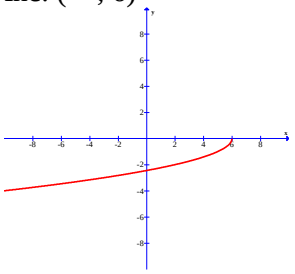
115) D: $(-\infty, \infty)$ R: $[-3, \infty)$ Inc: $(0, \infty)$



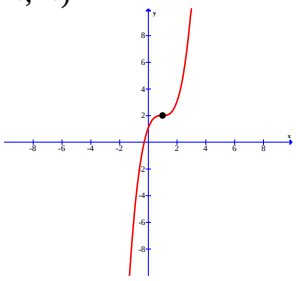
116) D: $(-\infty, 2)\ (2, \infty)$ R: $(-\infty, 0)\ (0, \infty)$ Inc: none



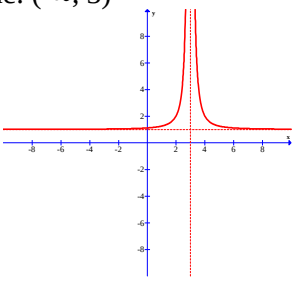
117) D: $(-\infty, 6]$ R: $(-\infty, 0]$ Inc: $(-\infty, 6)$



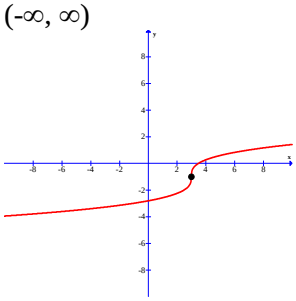
118) D: $(-\infty, \infty)$ R: $(-\infty, \infty)$ Inc: $(-\infty, \infty)$



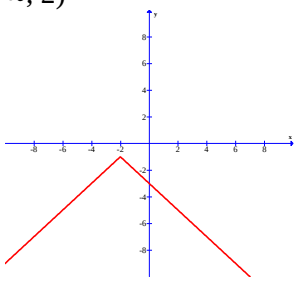
119) D: $(-\infty, 3)$ $(3, \infty)$ R:$(1, \infty)$ Inc: $(-\infty, 3)$



120) D: $(-\infty, \infty)$ R: $(-\infty, \infty)$ Inc: $(-\infty, \infty)$



121) D: $(-\infty, \infty)$ R: $(-\infty, -1]$ Inc: $(-\infty, 2)$



122) (-1, 1)

123) $\dfrac{-2}{h+1}$

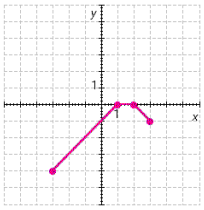
124) f(1) = 1, f(3) = 18, f(7) = 50

125) $f(a+5) = a^2 + 10a + 26$

126) $12a^2 + 12ah + 4h^2$

127) $\left[\dfrac{7}{8}, \infty\right)$

128)



129) (A) 0 (B) 1500 (C) 5400

130) –5

131) –2

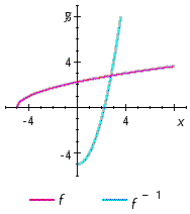
132) $f^{-1}(x) = \dfrac{9x-2}{5x-7}$

133) $f^{-1}(x) = (x-7)^3$

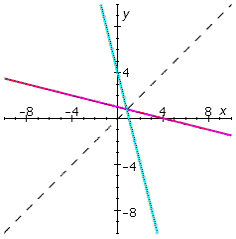
134) 94

135) -27

136) $f^{-1} = x^2 - 5$



137) $f^{-1} = 4 - 4x$



138) vertex (1, –1); *x*-intercepts 0, 2; y-intercept 0

139) vertex (3, –1); x-intercepts 2, 4; y-intercept 8

140) max = 16

141) min = 3

142) D = $(-\infty, \infty)$, R = $[-34, \infty)$

143) 100 feet

144) $y = 11$

145) 45

146) A) 3 B) 4

147) A) \$256 B) 8

148) $y = -6x^2 + 36x - 53$

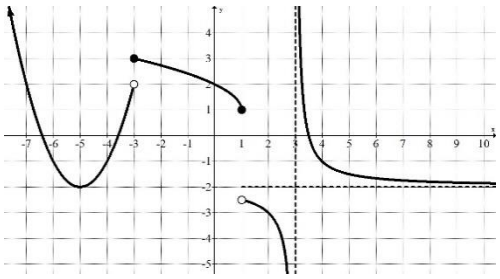
149) A) –19 B) –4

150) [0, 8]

151)

$$f(x) = \begin{cases} -2x - 5 & x < -3 \\ -|x+2| + 3 & -3 \le x \le 0 \\ (x-1)^3 - 2 & 0 \le x \le 3 \\ \dfrac{1}{(x-5)^2} + 1 & x > 3 \end{cases}$$

152)



153) $f(x) = \dfrac{2(x-1)(x+1)}{(x-2)(x+2)}$

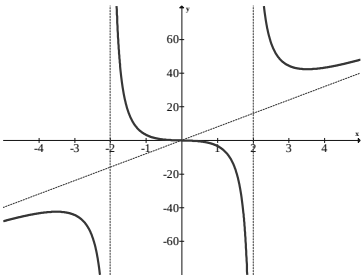
154) VA: $x = 2$, $x = -2$; SA: $y = x + 4$

155) (A) $x = 1$; (B) $y = 1$; (C) $x = -1$, $x = 5$; (D) $y = 0$

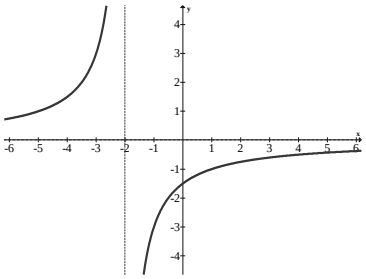
156) (A) $x = 9$; (B) $y = 9$; (C) $x = -3$; (D) $y = 1$

157) (A) no solution; (B) $y = -3$; (C) $x = -1$, $x = 3$; (D) $y = 3$

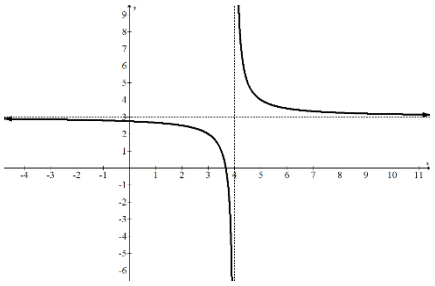
158)



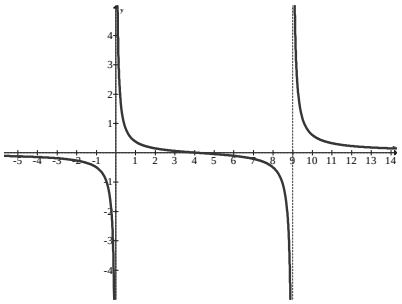
159)



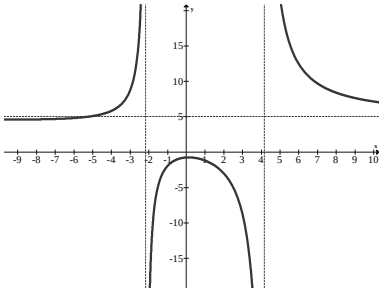
160)



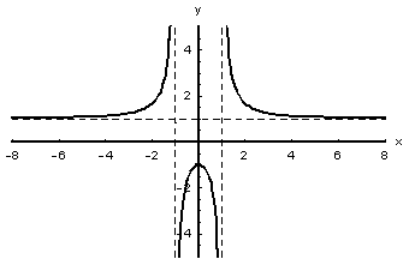
161)



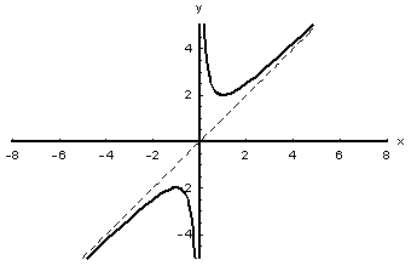
162)



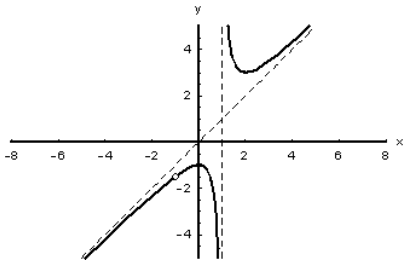
163)



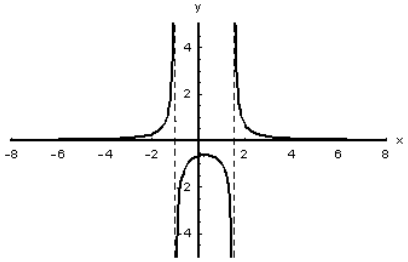
164)



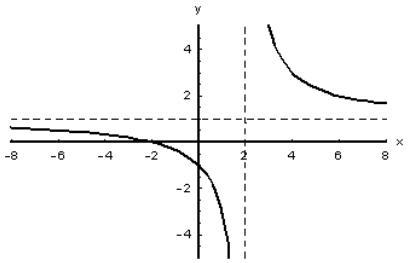
165)



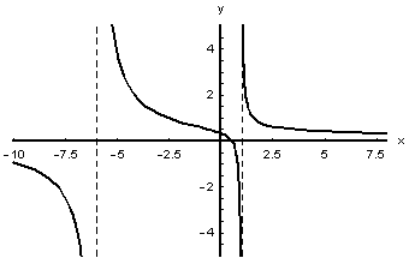
166)



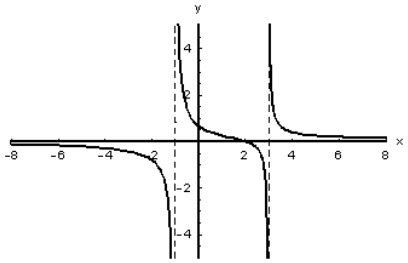
167)



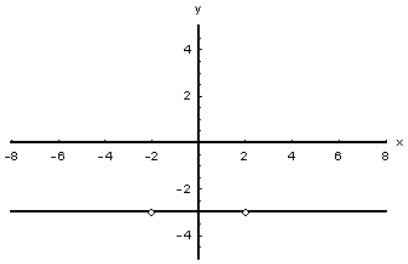
168)



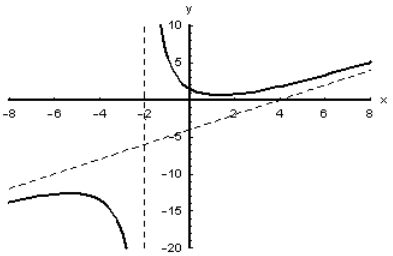
169)



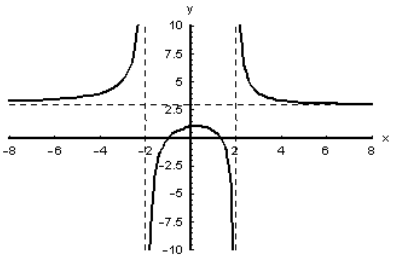
170)



171)



172)



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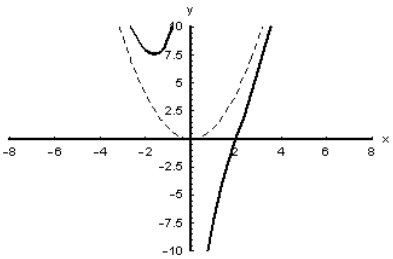

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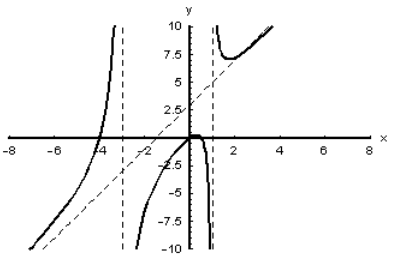

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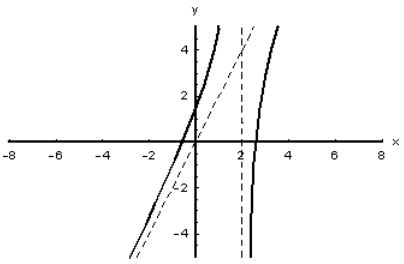

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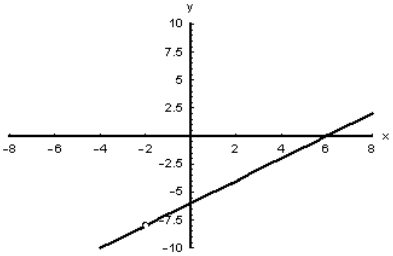


177) $\frac{47}{4}$

178) $ln\left(1+\sqrt{5}\right)+3$

179) $18000 = 405\left(\frac{1-\left(1+\frac{r}{12}\right)^{-60}}{\frac{r}{12}}\right)$

180) $2000 = P\left(\frac{\left(1+\frac{0.06}{12}\right)^{8}-1}{\frac{0.06}{12}}\right)$

181) $A = 3000\left(1+\frac{0.06}{4}\right)^{12}$

182) $25000 = 4000\left(1+\frac{0.09}{2}\right)^{2t}$

183) $\frac{ln\,9}{ln\,5 - ln\,3}$

184) 1, -1

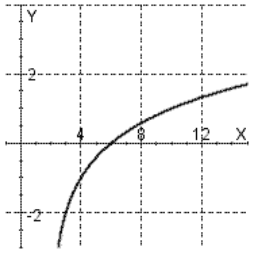
185) 3, -2

186) (2, ∞)

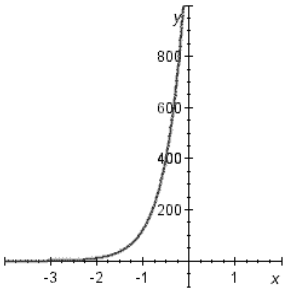
187) (-∞, 8)

188) Domain: (-∞,∞);
Range: (-∞, 5)

189)

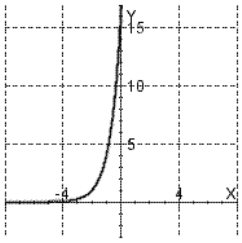


190)



Domain: (-∞, ∞).
Range: (0, ∞).
Asymptote: y = 0.

191)



192) (A) 81; (B) –6

193) (-3, ∞)

194) $log_3 A + 5 log_3 B$

195) $ln 3 + 5 ln x - 9 ln(x+1)$

196) $log\left(\frac{x^5(x-1)^4}{\sqrt[3]{x^2+1}}\right)$

197) $log_3\left(\frac{x^2 y^4}{z^8}\right)$

198) A) -1 B) -9 C) 32 D) $-\frac{5}{4}$

199) s; 12 + 4s; 12 + 99s

200) $\frac{1}{2}$

201) $a_1 = \frac{81}{625}$, $a_2 = \frac{27}{125}$, $a_3 = \frac{9}{25}$

202) 52.5; 56

203) $16A^4 + 32A^3B^2 + 24A^2B^4 + 8AB^6 + B^8$

204) $42240x^4y^7$

205) $S_7 = 140$

206) $S_5 = 1$

207) $a_n = 2^n$

208) 2, 4, 8, 16

209) $\frac{-1}{1}, \frac{1}{4}, \frac{-1}{9}, \frac{1}{16}$

210) $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}$

211) $\frac{2}{1}, \frac{5}{2}, \frac{10}{6}, \frac{17}{24}$

212) $a_n = 3n - 2$

213) $a_n = 2\left(-\frac{1}{2}\right)^{n-1}$

214) $a_n = \frac{n}{(n+1)(n+2)}$

215) $a_n = -\frac{1}{2}\left(-\frac{2}{3}\right)^{n-1}$

216) $a_n = n!$

217) 74

218) $\frac{2}{42} = \frac{1}{21}$

219) $\frac{2}{43}$

220) $a_n = \frac{n-2}{n+1} \Rightarrow a_{42} = \frac{40}{43}$

221) 170

222) –8

223) 12

224) $-\frac{1}{3}$

225) $\frac{4}{3}$

226) 820

227) 1,277,255

228) 34,408