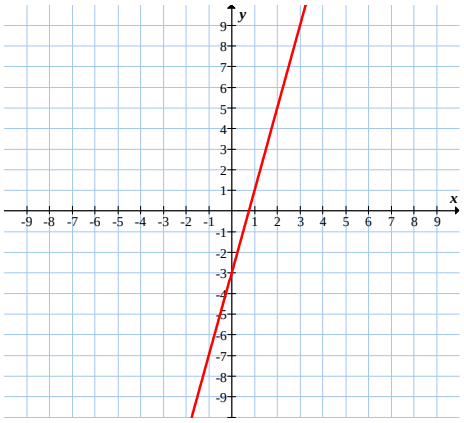
PRECALCULUS REVIEW

PART 2: SOLUTIONS

(A) FUNCTIONS

1. (a) Domain: $x \in (-\infty, \infty)$ Range: $y \in (-\infty, \infty)$

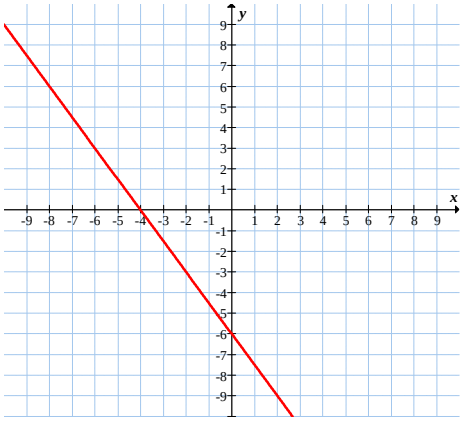
(b)



(c) $f^{-1}(x) = \dfrac{x+3}{4} = \dfrac{1}{4}x + \dfrac{3}{4}$

2. (a) Domain: $x \in (-\infty, \infty)$ Range: $y \in (-\infty, \infty)$

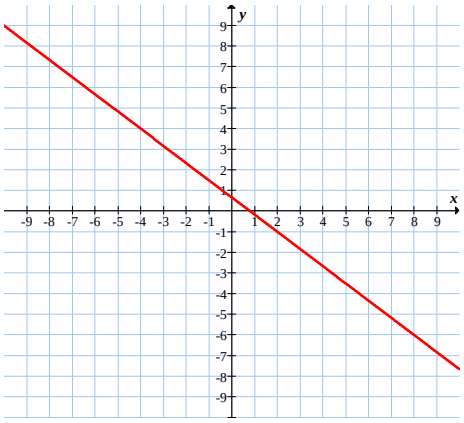
(b)



(c) $f^{-1}(x) = -\dfrac{2}{3}x - 4$

3. (a) Domain: $x \in (-\infty, \infty)$ Range: $y \in (-\infty, \infty)$

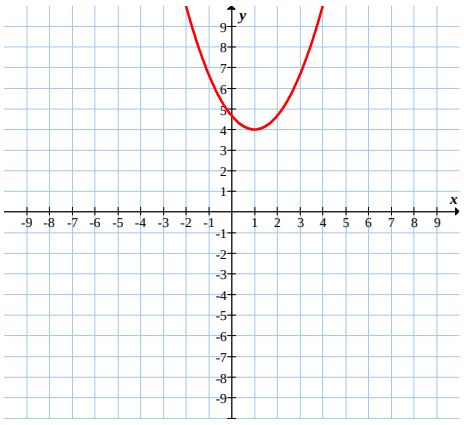
(b)



(c) $f^{-1}(x) = \dfrac{6x-4}{-5} = \dfrac{4}{5} - \dfrac{6}{5}x$

4. (a) Domain: $x \in (-\infty, \infty)$ Range: $y \in [4, \infty)$

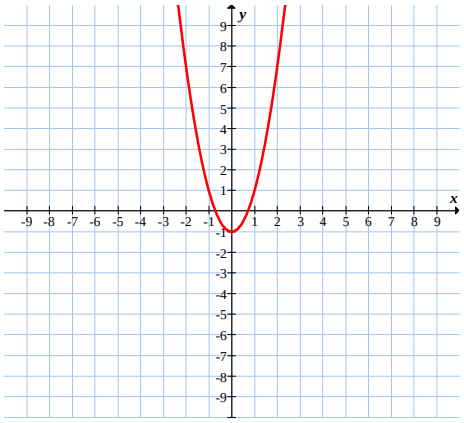
(b)



(c) $f^{-1}(x) = \sqrt{\dfrac{3}{2}(x-4)} + 1$

5. (a) Domain: $x \in (-\infty, \infty)$ Range: $y \in [-1, \infty)$

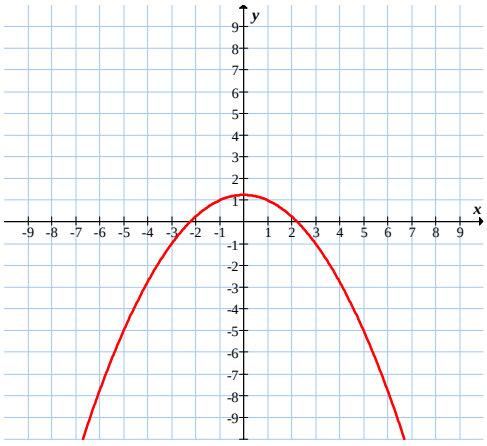
(b)



(c) $f^{-1}(x) = \sqrt{\dfrac{x+1}{2}} = \sqrt{\dfrac{1}{2}x + \dfrac{1}{2}}$

6. (a) Domain: $x \in (-\infty, \infty)$ Range: $y \in \left(-\infty, \dfrac{5}{4}\right]$

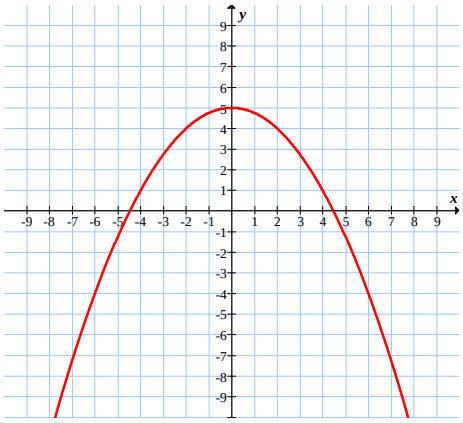
(b)



(c) $f^{-1}(x) = \sqrt{5 - 4x}$

7. (a) Domain: $x \in (-\infty, \infty)$ Range: $y \in (-\infty, 5]$

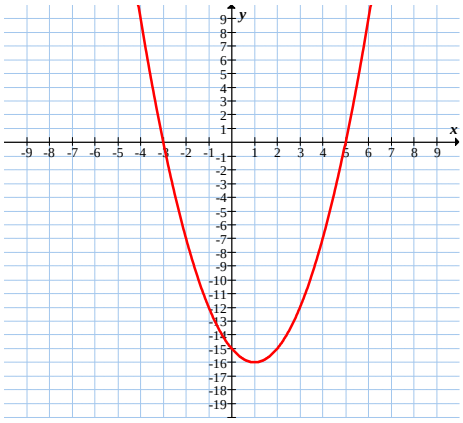
(b)



(c) $f^{-1}(x) = \sqrt{20 - 4x}$

8. (a) Domain: $x \in (-\infty, \infty)$ Range: $y \in [-16, \infty)$

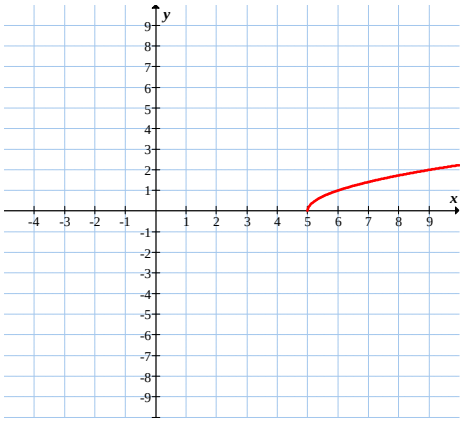
(b)



(c) $f^{-1}(x) = \sqrt{x + 16} + 1$

9. (a) Domain: $x \in [5, \infty)$ Range: $y \in [0, \infty)$

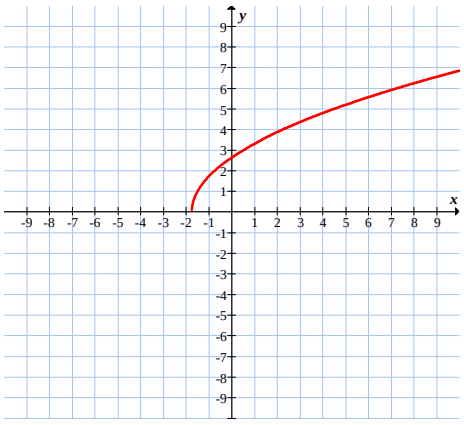
(b)



(c) $f^{-1}(x) = x^2 + 5$

10. (a) Domain: $x \in \left[-\frac{7}{4}, \infty\right)$ Range: $y \in [0, \infty)$

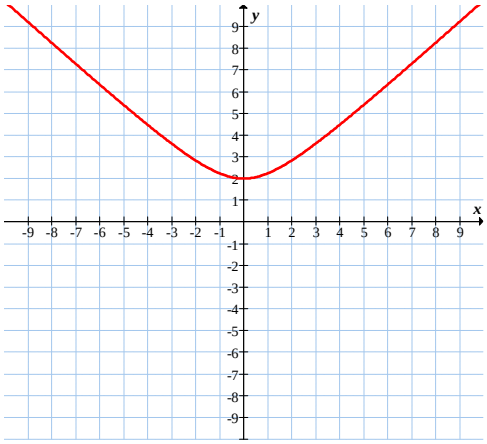
(b)



(c) $f^{-1}(x) = \frac{x^2 - 7}{4} = \frac{1}{4}x^2 - \frac{7}{4}$

11. (a) Domain: $x \in (-\infty, \infty)$ Range: $y \in [0, \infty)$

(b)

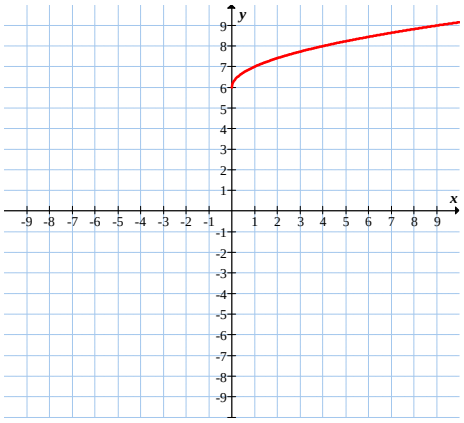


Note: This is the upper half of a HYPERBOLA

(c) $f^{-1}(x) = \sqrt{x^2 - 4}$

12. (a) Domain: $x \in [0, \infty)$ Range: $y \in [6, \infty)$

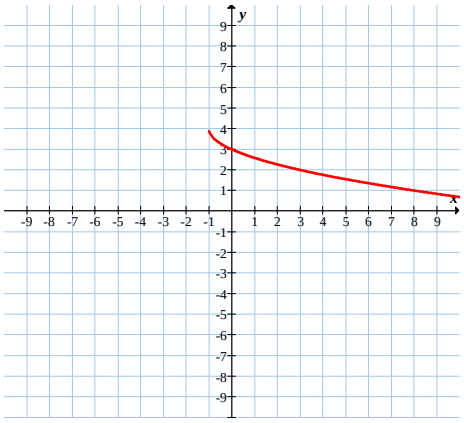
(b)



(c) $f^{-1}(x) = (x-6)^2$

13. (a) Domain: $x \in [-1, \infty)$ Range: $y \in (-\infty, 4]$

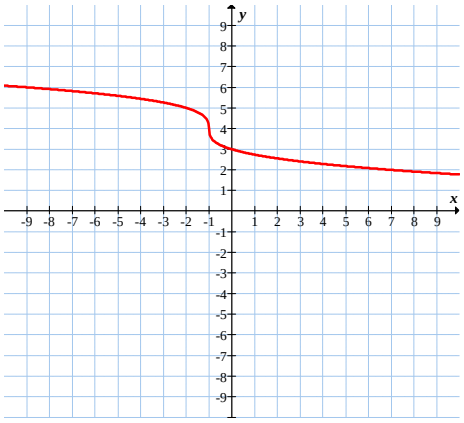
(b)



(c) $f^{-1}(x) = (4-x)^2 - 1$

14. (a) Domain: $x \in (-\infty, \infty)$ Range: $y \in (-\infty, \infty)$

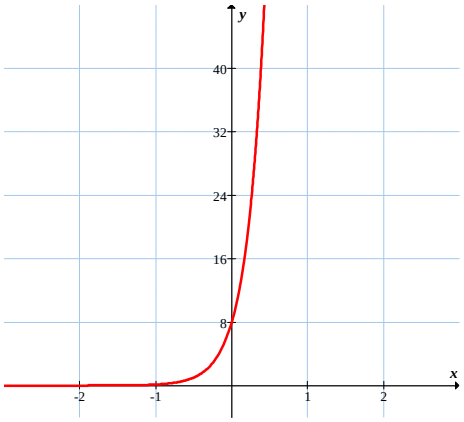
(b)



(c) $f^{-1}(x) = (4-x)^3 - 1$

15. (a) Domain: $x \in (-\infty, \infty)$ Range: $y \in [0, \infty)$

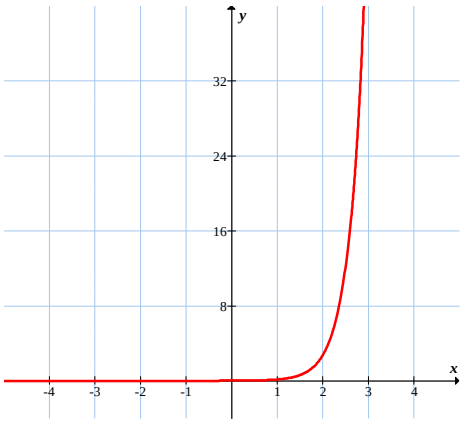
(b)



(c) $f^{-1}(x) = \dfrac{\log_8 x - 1}{2} = \dfrac{1}{2}\log_8 x - \dfrac{1}{2} = \log_8 \sqrt{x} - \dfrac{1}{2}$

16. (a) Domain: $x \in (-\infty, \infty)$ Range: $y \in [0, \infty)$

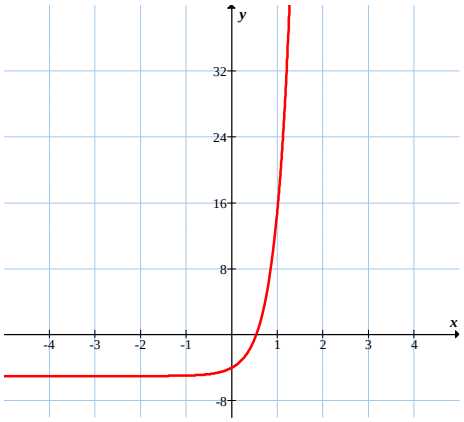
(b)



(c) $f^{-1}(x) = \dfrac{\ln x + 5}{3} = \dfrac{1}{3}\ln x + \dfrac{5}{3} = \ln \sqrt[3]{x} + \dfrac{5}{3}$

17. (a) Domain: $x \in (-\infty, \infty)$ Range: $y \in [-5, \infty)$

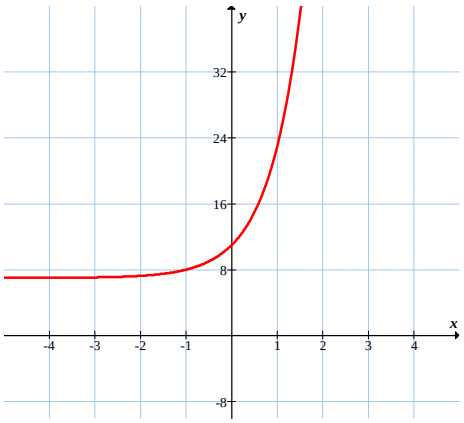
(b)



(c) $f^{-1}(x) = \dfrac{\ln(x+5)}{3} = \dfrac{1}{3}\ln(x+5) = \ln\sqrt[3]{x+5}$

18. (a) Domain: $x \in (-\infty, \infty)$ Range: $y \in [7, \infty)$

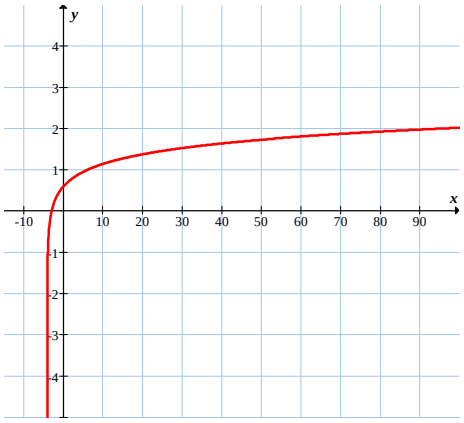
(b)



(c) $f^{-1}(x) = \log_4(x-7) - 1$

19. (a) Domain: $x \in (-4, \infty)$ Range: $y \in (-\infty, \infty)$

(b)



(c) $f^{-1}(x) = 10^x - 4$

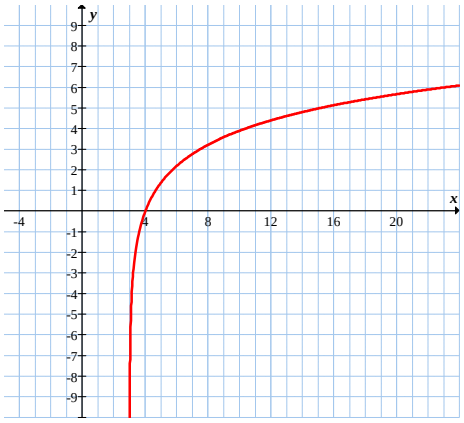
20. (a) Domain: $x \in (0, \infty)$ Range: $y \in (-\infty, \infty)$

(b)

(c) $f^{-1}(x) = \frac{1}{2} \cdot 7^{x+1}$

21. (a) Domain: $x \in (3, \infty)$ Range: $y \in (-\infty, \infty)$

(b)



(c) $f^{-1}(x) = e^{x/2} + 3$

22. (a) Domain: $x \in (7, \infty)$ Range: $y \in (-\infty, \infty)$

(b)

(c) $f^{-1}(x) = 5^x + 7$

(B) FUNCTIONS OPERATIONS AND NOTATION

23. -10

24. $\sqrt{t-9}$

25. 70

26. 82

27. $4a^2+5$

28. $2a^2+10$

29. $3x+3h+2$

30. -16

31. $\dfrac{x^2+5}{3x+2};\ x \neq -\dfrac{2}{3}$

32. 2

33. 9

34. $\log\left(x^2+7\right)$

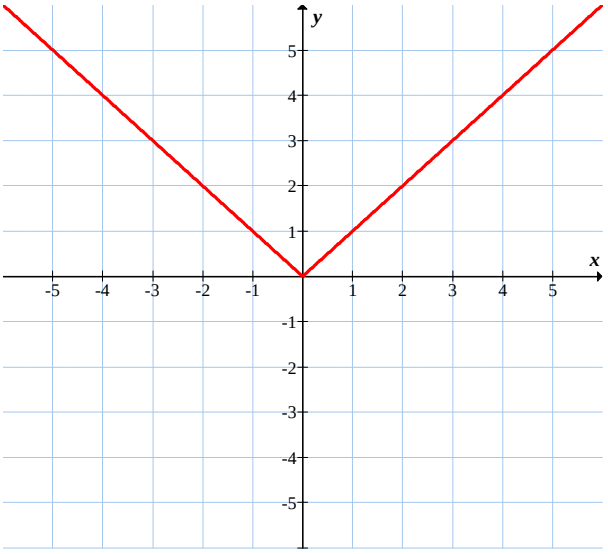
35. 5

36. $x-4$

(C) GRAPH TRANSFORMATIONS

37. (a)

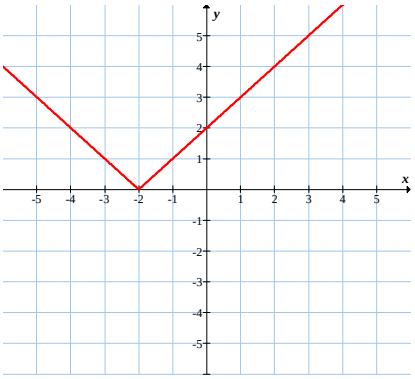
x	$y = f(x)$
–3	3
–2	2
–1	1
0	0
1	1
2	2
3	3



37. (continued)

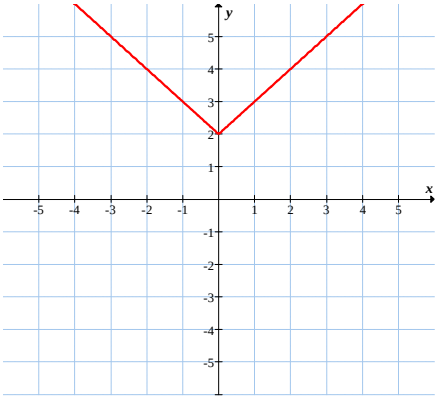
(b) (i)

x	$y = f(x)$
–5	3
–4	2
–3	1
–2	0
–1	1
0	2
1	3



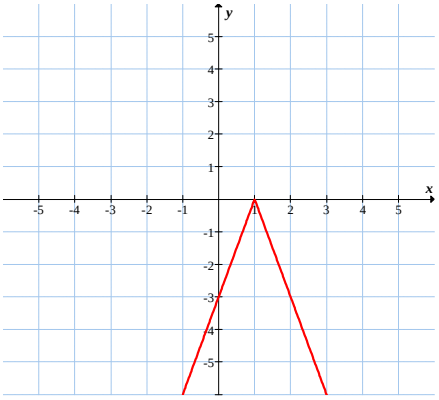
(ii)

x	$y = f(x)$
–3	5
–2	4
–1	3
0	2
1	3
2	4
3	5



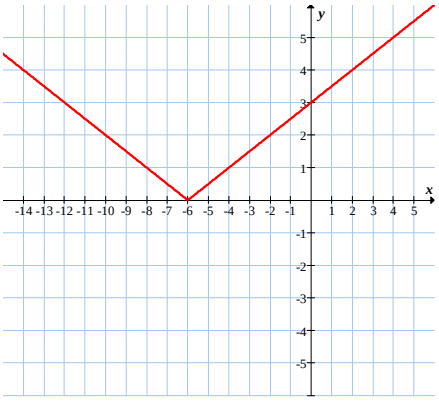
(iii)

x	$y = f(x)$
–2	–9
–1	–6
0	–3
1	0
2	–3
3	–6
4	–9



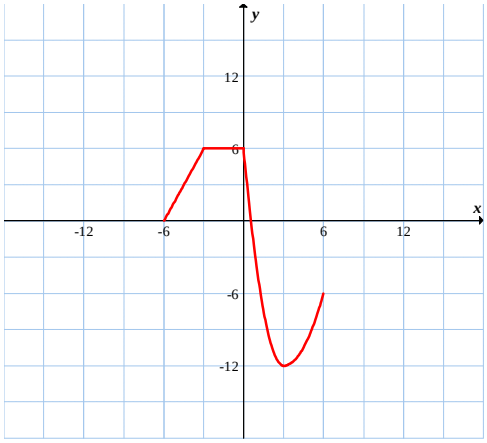
(iv)

x	$y = f(x)$
–12	3
–10	2
–8	1
–6	0
–4	1
–2	2
0	3



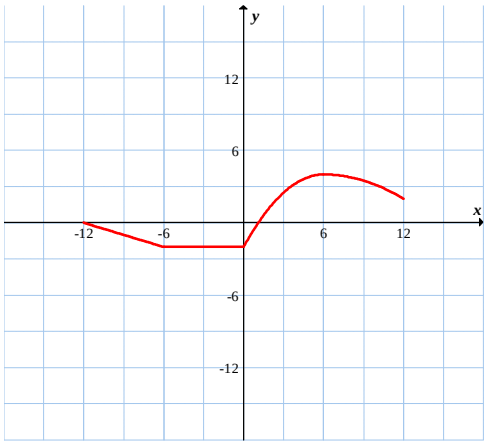
38.

x	y
–6	0
–3	6
0	6
3	–12
6	–6



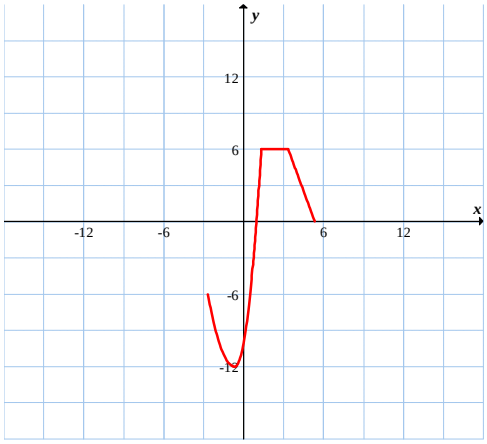
39.

x	y
–12	0
–6	–2
0	–2
6	4
12	2



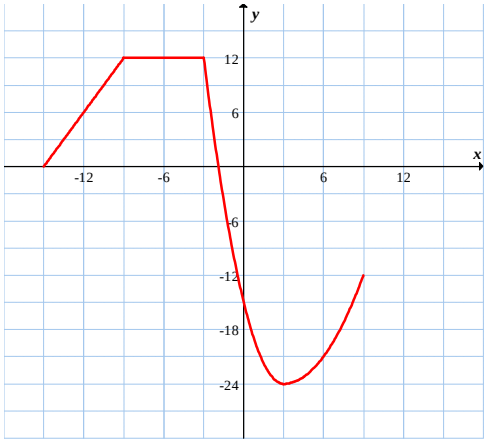
40.

x	y
16/3	0
10/3	6
4/3	6
–2/3	–12
–8/3	–6



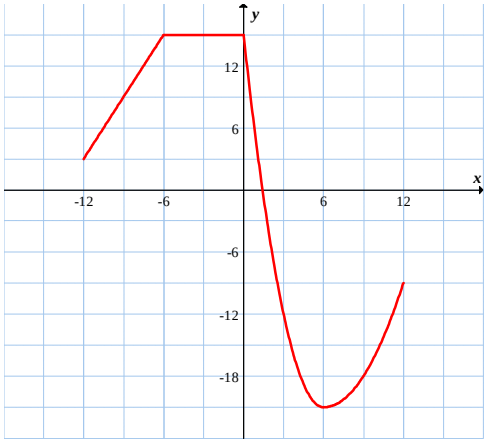
41.

x	y
–15	0
–9	12
–3	12
3	–24
9	–12



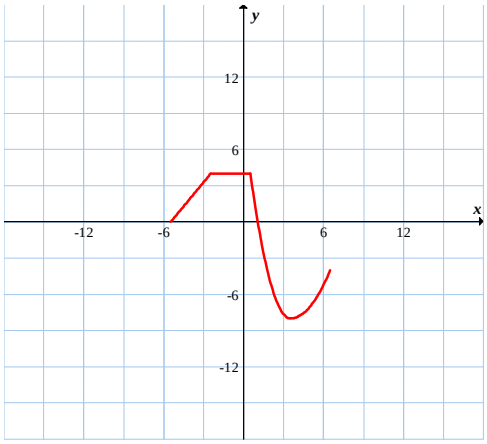
42.

x	y
–12	3
–6	15
0	15
6	–21
12	–9



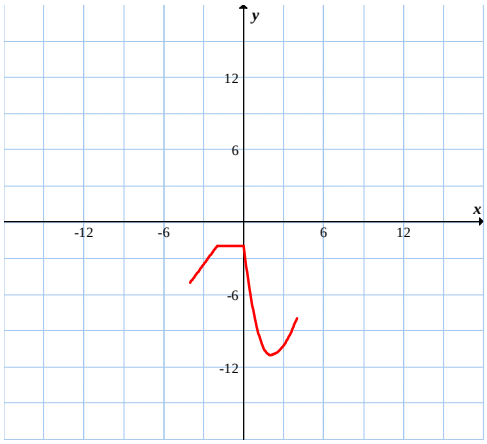
43.

x	y
–11/2	0
–5/2	4
1/2	4
7/2	–8
13/2	–4



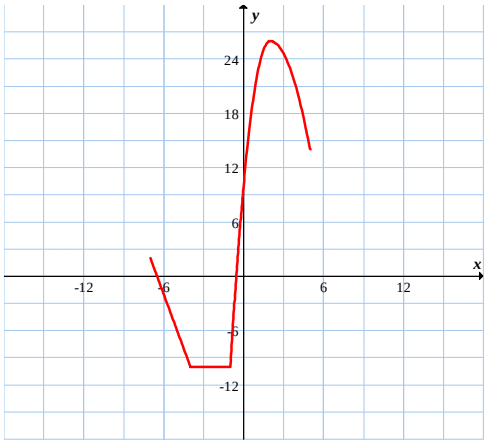
44.

x	y
–4	–5
–2	–2
0	–2
2	–11
4	–8



45.

x	y
–7	2
–4	–10
–1	–10
2	26
5	14



(D) THE DIFFERENCE QUOTIENT

46. 2

47. -4

48. $2x+h$

49. $6x+3h-4$

50. $3x^2+3xh+h^2$

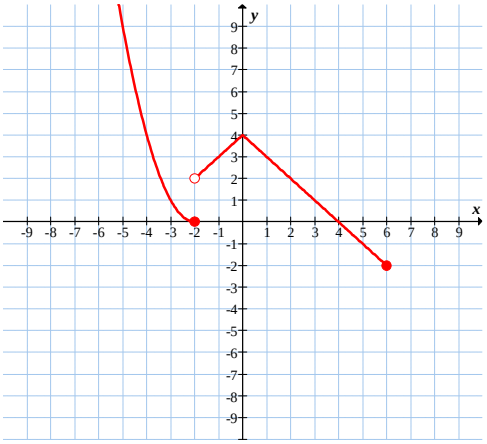
51. $-\dfrac{4}{x^2+xh}$

52. $\dfrac{1}{\sqrt{x+h}+\sqrt{x}}$

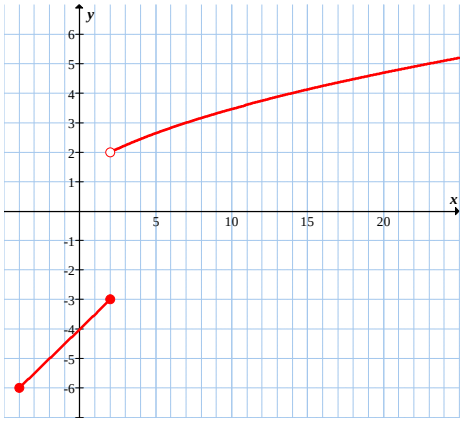
53. $\dfrac{3}{\sqrt{3x+3h-2}+\sqrt{3x-2}}$

(E) PIECEWISE FUNCTIONS

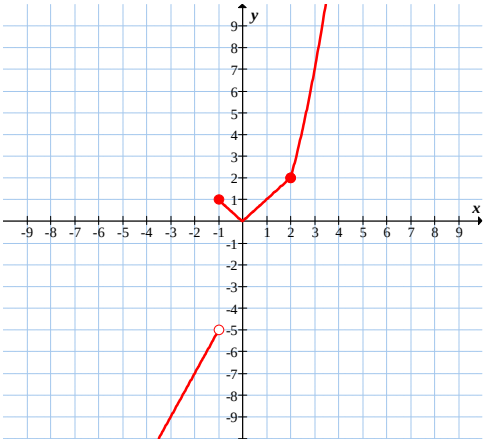
54.



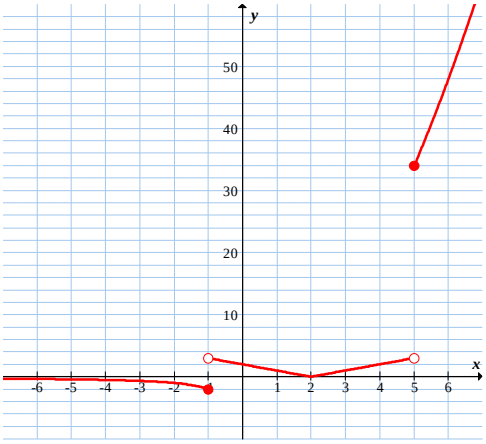
55.



56.



57.



(F) POLYNOMIAL, RATIONAL & RADICAL EQUATIONS

58. $x = -3$ or $x = \pm\sqrt{\frac{5}{2}}$

59. $x = \pm\sqrt[4]{9}$, $x = 5$ or $x = -1$

60. $x = \pm 3$ or $x = \pm 2$

61. $x = 1$ or $x = -2$

62. $x = \frac{7}{3}$

63. $x = 2$

64. No Real Solution

65. $x = -8$

66. $x = -2$

67. $x = \frac{12}{5}$ or $x = -\frac{4}{5}$

68. $x = 17$

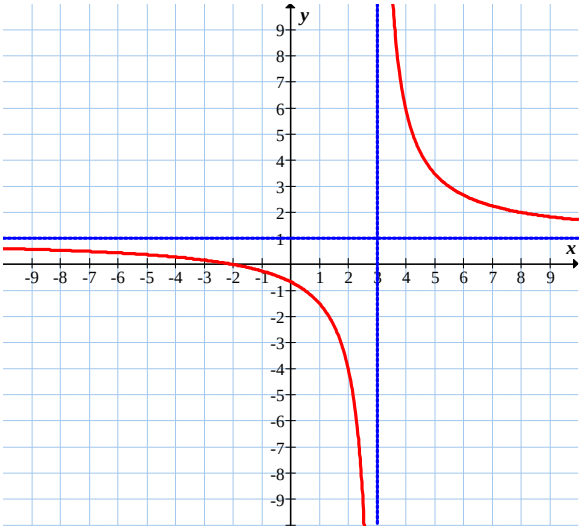
69. No Real Solution

70. $x = 9$

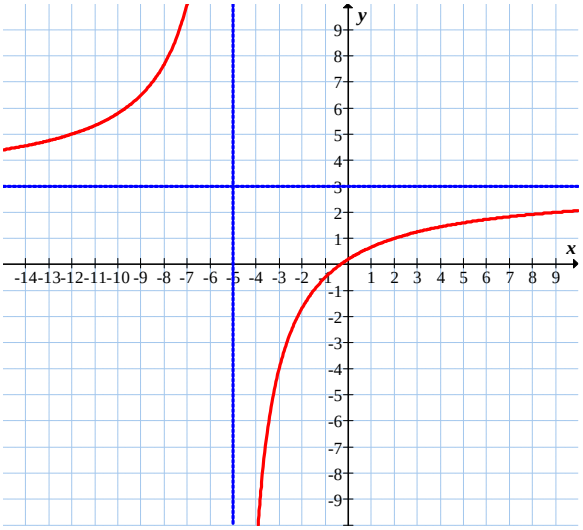
71. $x = \pm 3$

(G) RATIONAL FUNCTIONS

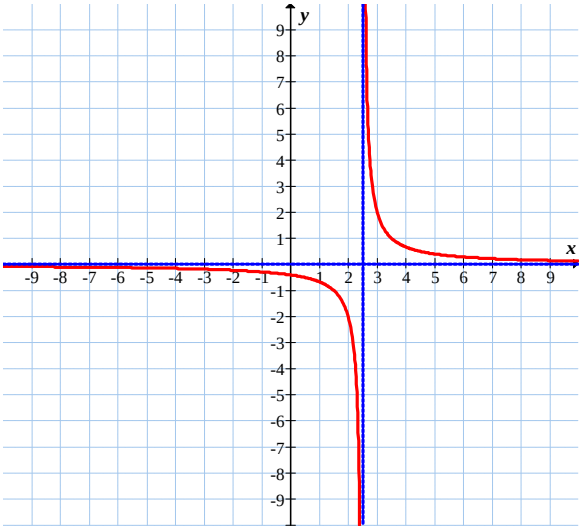
72. Vertical Asymptote $x = 3$
Horizontal Asymptote $y = 1$



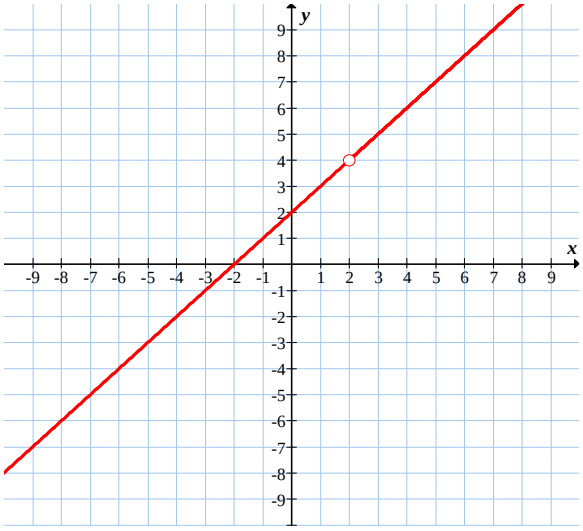
73. Vertical Asymptote $x = -5$
Horizontal Asymptote $y = 3$



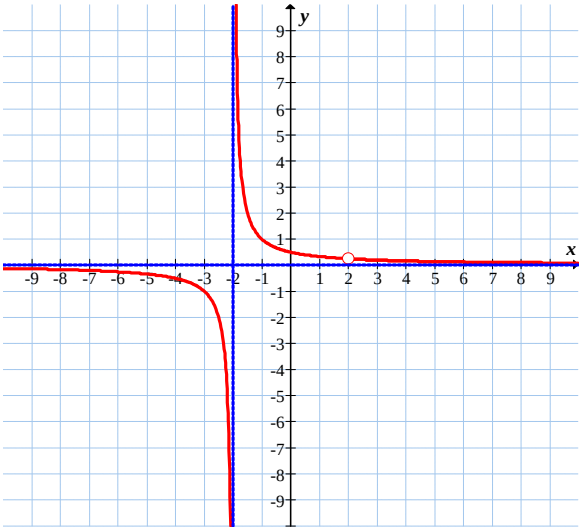
74. Vertical Asymptote $x = \frac{5}{2}$
Horizontal Asymptote $y = 0$



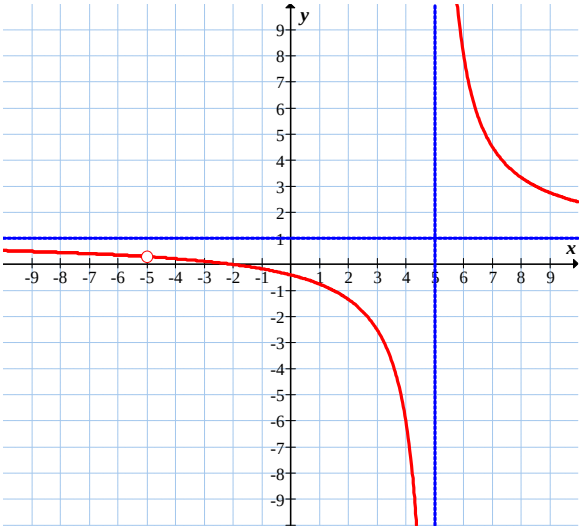
75. Hole $(2, 4)$



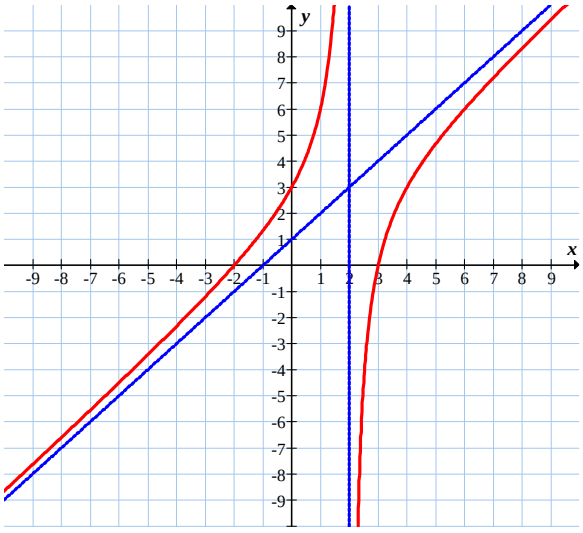
76. Vertical Asymptote $x = -2$
Horizontal Asymptote $y = 0$
Hole $\left(2, \frac{1}{4}\right)$



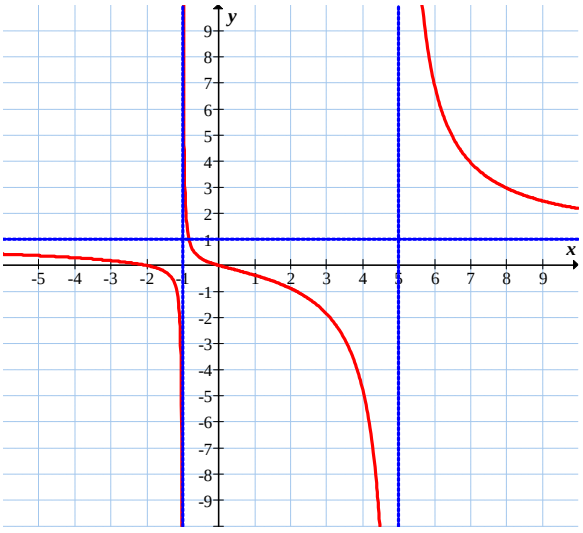
77. Vertical Asymptote $x = 5$
Horizontal Asymptote $y = 1$
Hole $\left(-5, \frac{7}{10}\right)$



78. Vertical Asymptote $x = 2$
Oblique Asymptote $y = x + 1$



79. Vertical Asymptotes $x = -1$ and $x = 5$
Horizontal Asymptote $y = 1$



(H) EXPONENTIAL & LOGARITHMIC EQUATIONS

80. $x = 1$

81. $x = \dfrac{3 \pm \sqrt{57}}{4}$

82. $x = \dfrac{\log_7 20 + 1}{2} \approx 1.2698$

83. $x = \dfrac{\ln 8 - 5}{4} \approx -0.7304$

84. $x = \dfrac{\log_2 18 - 1}{3} \approx 1.0566$

85. No Real Solution

86. $x = e^4 - 3 \approx 51.5982$

87. $x = 4$

88. $x = 3$

89. $x = 2045$

90. $x = 0$

91. $x = \dfrac{997}{2} = 498.5$

92. (a) about 1.6412 milligrams **(b)** about 325 days

93. approximately 7.19 months

94. approximately 11.2 years

95. (a) approximately 5282 years **(b)** about 98.7%