# Answers

1. $x = -\dfrac{1}{2}$ or $x = 1$

2. $\dfrac{3x - x^2 - 4}{2(x^2 + 4)}$

3. Rewrite as $\dfrac{6 - x}{x - 1} \leq 0$; Solution: $(-\infty, 1) \cup [6, \infty)$

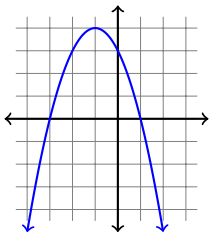
4. a) $4x + 2h - 1$ b) $\dfrac{\dfrac{x+h}{(x+h)+4} - \dfrac{x}{x+4}}{h} = \dfrac{4}{(x+h+4)(x+4)}$

5. a) $(f \circ g)(x) = \dfrac{2 + x}{2 - x}$, domain: $(-\infty, 0) \cup (0, 2) \cup (2, \infty)$

   b) $(g \circ f)(x) = \dfrac{3x - 4}{x}$, domain: $(-\infty, 0) \cup (0, 2) \cup (2, \infty)$

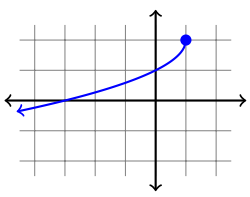
6. $\dfrac{f}{g}(x) = \dfrac{x - 1}{x}$, domain: $(1, \infty)$

7. vertex: $(-1, 4)$, intercepts: $(-3, 0)$, $(1, 0)$ and $(0, 3)$
   standard form: $f(x) = -(x + 1)^2 + 4$
   translate the graph of $y = x^2$ by reflecting over the $x$-axis,
   left 1 unit and up 4 units

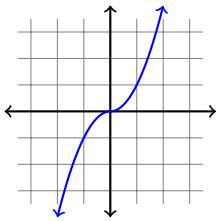


8. Two options: 1) $y = -\sqrt{-(x - 1)} + 2$: reflect the graph of $y = \sqrt{x}$ over $y$-axis, shift right one unit, reflect over $x$-axis, shift up 2

   2) $y = -\sqrt{-x + 1} + 2$: shift the graph of $y = \sqrt{x}$ left one unit, reflect over the $y$-axis, reflect over the $x$-axis, shift up 2



9. $g(x) = \begin{cases} -x^2 & x < 0 \\ x^2 & x \geq 0 \end{cases}$



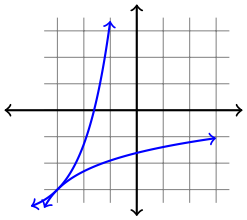
10. $f^{-1}(x) = 4 - x^2,\ x \geq 0$

11. $f^{-1}(x) = \dfrac{3x+2}{x-1}$; domain $(-\infty, 1) \cup (1, \infty)$
range of $f$: $(-\infty, 1) \cup (1, \infty)$, horizontal asymptote: $y = 1$

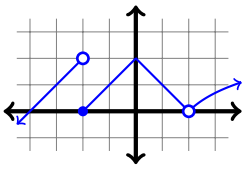
12. (a) domain: $[-2, 0] \cup [3, \infty)$ (b) domain: $(0, 4)$

13. (a) $x = \dfrac{5}{2}$ (b) $x = -\dfrac{3}{2}$ and $x = 3$ (c) $x = 3$

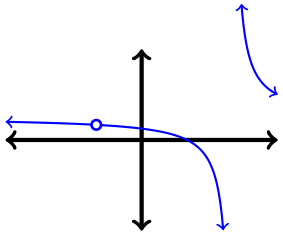
14. $f^{-1}(x) = \ln(x+4) - 3$



15. (a) 0, 0, 2, $f(2)$ is undefined, 1 (c) 1) does not exist; 2) 2; 3) 0



16. (a) $(-\infty, -2) \cup (-2, 4) \cup (4, \infty)$ (b) $\left(0, \dfrac{1}{2}\right)$, $(2, 0)$ (c) VA: $x = 4$, HA: $y = 1$



(d)

(e) $\lim\limits_{x \to -2} f(x)$ does not exist; $\lim\limits_{x \to 4} f(x) = \dfrac{2}{3}$ (hole in graph at $(-2, \dfrac{2}{3})$

17. $C = \frac{5}{9}F - \frac{160}{9}$; $86°F$

$m$: Temperature increases $5°C$, as Fahrenheit temperature increases by $9°$

18. (a) $C(x) = 0.783x + 182.02$, $r = 0.95596$

(b) fixed costs are $C(0)$: \$18,202, $C(1000) = \$96{,}502$

(c) marginal cost is 0.783; additional cost (in hundreds) of producing one more item

19. $q = 2$ (2000 items); price is \$52

if unit price is \$40; supply is 1000 items($q = 1$) and demand is 3162 items ($q = \sqrt{10}$); price will rise

20. (a) $p = -\frac{1}{50}x + 20$

(b) $R(x) = -\frac{1}{50}x^2 + 20x$; $x = 500$ and maximum revenue is \$5000

(c) break even when $x = 100$ and when $x = 400$; profit is \$0

(c) $P(x) = -\frac{1}{50}x^2 + 10x - 800$; maximum profit is at price \$15 when $x = 250$

21. $A(x) = 1500x - \frac{3}{2}x^2$; area is maximized when $x = 500$ and the other side has length 750 feet

22. (a) $2\log x - 3$ (b) $\frac{x+1}{3} + \frac{4\ln(x-2)}{3} - 2\ln x$

23. $t = \frac{\ln(8/5)}{0.055} \approx 8.5$ years

24. $P = \frac{6000}{(1.008125)^{12}} \approx \$5444.76$

25. $Q(t) = Q_0 e^{\frac{\ln(1/2)}{8}t}$; $t = \frac{8\ln(0.1)}{\ln(0.5)} \approx 26.57$ days

26. (Assume the side of each square in the grid has length one unit):

a) $+\infty$ b) $-\infty$ c) Does not exist

d) 1 e) 0 f) Does not exist

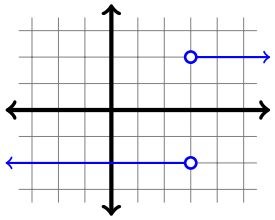
g) 3 h) 0 i) 2

27. $-\frac{3}{2}$

28. (a) $\frac{3}{2}$ (b) $-\frac{1}{2}$

29. $p = \frac{8}{5}$ and $q = +\infty$

30. $f(x) = \begin{cases} -2 & x < 3 \\ 2 & x > 3 \end{cases}$



(a) $-2$ (b) 2 (c) DNE

31. (a) 2 (b) $\frac{1}{2}$ (c) $+\infty$ (d) $-1$

$x = -1$: removable, $x = 0$: removable, $x = 1$: infinite

vertical asymptote: $x = 1$, horizontal asymptote: $y = -1$

32. 1) 0 2) $-\frac{2}{3}$ 3) $x = \ln\frac{1}{3}$; $y = 0$ and $y = -\frac{2}{3}$

33. B or D

34. (a) $(-\infty, -2) \cup 0) \cup (0, 3) \cup (3, 4) \cup (4, \infty)$

(b) 0

(c) 4

(d) 2, 3