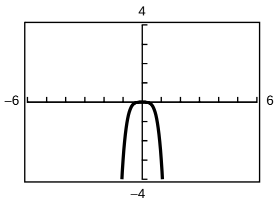
24. $f(x) = -x^6 - 2x^4$

(a)

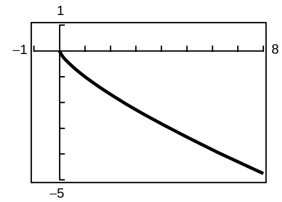


(b) The graph is increasing on $(-\infty, 0)$ and decreasing on $(0, \infty)$

(c) $f(-x) = -(-x)^6 - 2(-x)^4 = -x^6 - 2x^4 = f(x)$.
The function is even.

26. $f(x) = -x^{3/4}$

(a)

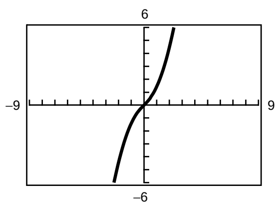


(b) The graph is decreasing on $(0, \infty)$

(c) The function is neither even nor odd. (Domain: $(0, \infty)$)

28. $f(x) = x(x^2 + 1)^{1/2}$

(a)



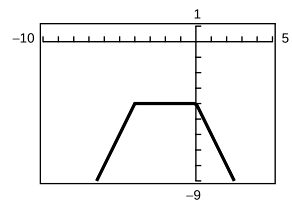
(b) The graph is increasing on $(-\infty, \infty)$

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

The function is odd.

30. $f(x) = -|x + 4| - |x + 1|$

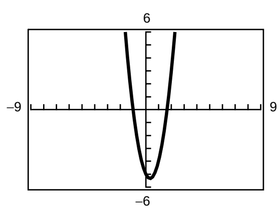
(a)



(b) The graph is increasing on $(-\infty, -4)$, constant on $(-4, -1)$, and decreasing on $(-1, \infty)$.

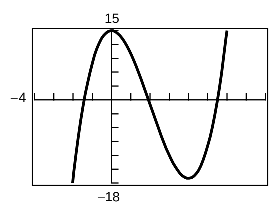
(c) From the graph, it is clear that f is neither even nor odd.

32.



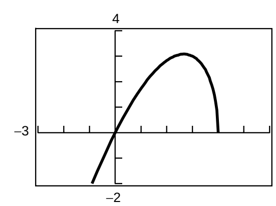
Relative minimum:
$(0.33, -5.33)$

34.



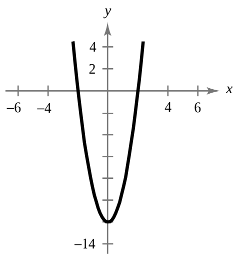
Relative minimum: $(4, -17)$
Relative maximum: $(0, 15)$

36.



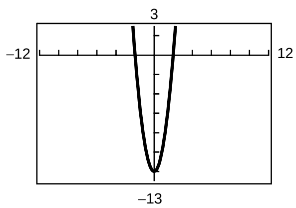
Maximum: $(2.67, 3.08)$

38. (a) $f(x) = 3x^2 - 12$



Relative minimum: $(0, -12)$

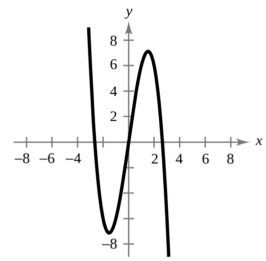
(b)



Relative minimum: $(0, -12)$

(c) The answer are the same.

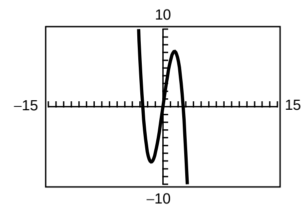
40. (a) $f(x) = -x^3 + 7x$



Approximate relative minimum: $\left(-\frac{3}{2}, -7\right)$

Approximate relative maximum: $\left(\frac{3}{2}, 7\right)$

(b)

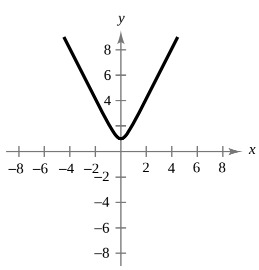


Relative minimum: $(-1.53, -7.13)$

Relative maximum: $(1.53, 7.13)$

(c) The answers are close.

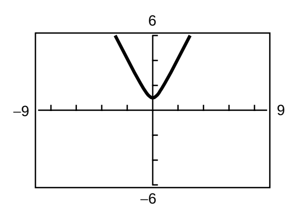
42. (a) $f(x) = \sqrt{4x^2 + 1}$



Relative minimum: $(0, 1)$

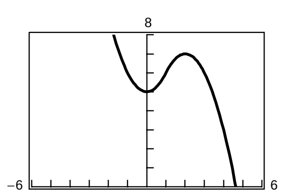
(c) The answers are the same.

(b)

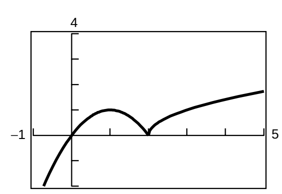


Relative minimum: $(0, 1)$

44. $f(x) = \begin{cases} x^2 + 5, x \le 1 \\ -x^2 + 4x + 3, x > 1 \end{cases}$



46. $f(x) = \begin{cases} 1 - (x - 1)^2, & x \le 2 \\ \sqrt{x - 2}, & x > 2 \end{cases}$



48. $f(-x) = (-x)^6 - 2(-x)^2 + 3$

$= x^6 - 2x^2 + 3 = f(x).$

f is even.

50. $h(x) = x^3 - 5$

$h(-x) = (-x)^3 - 5$

$= -x^3 - 5$

$\neq h(x)$

$\neq -h(x)$

The function is neither odd nor even.

52. $f(-x) = (-x)\sqrt{(-x) + 5}$

$= -x\sqrt{-x + 5}$

$\neq f(x)$

$\neq -f(x)$

The function is neither even nor odd.

54. Because the domain is $s \geq 0$, the function is neither even nor odd.

56. $\left(-\frac{5}{3}, -7\right)$

(a) If f is even, another point is $\left(\frac{5}{3}, -7\right)$.

(b) If f is odd, another point is $\left(\frac{5}{3}, 7\right)$.

58. $(5, -1)$

(a) If f is even, another point is $(-5, -1)$.

(b) If f is odd, another point is $(-5, 1)$.

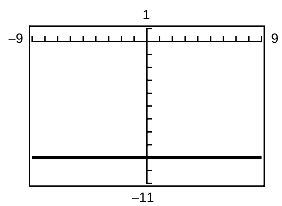
60. $(2a, 2c)$

(a) If f is even, another point is $(-2a, 2c)$.

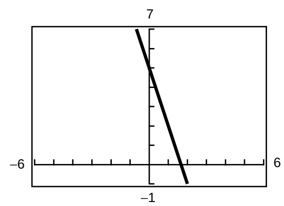
(b) If f is odd, another point is $(-2a, -2c)$.

62. $f(x) = -9$

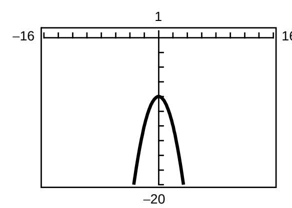
f is even.



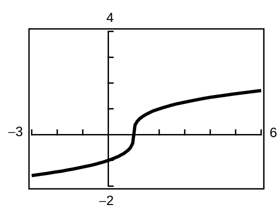
64. $f(x) = 5 - 3x$ is neither even nor odd.



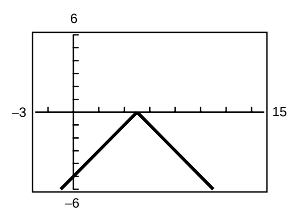
66. $f(x) = -x^2 - 8$ is even.



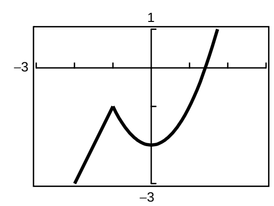
68. $g(t) = \sqrt[3]{t - 1}$ is neither even nor odd.



70. $f(x) = -|x - 5|$ is neither even nor odd.

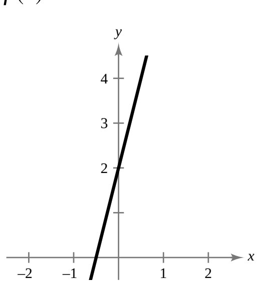


72. $f(x) = \begin{cases} 2x + 1, & x \leq -1 \\ x^2 - 2, & x > -1 \end{cases}$



The graph is neither odd nor even.

74. $f(x) = 4x + 2$



$f(x) \geq 0$

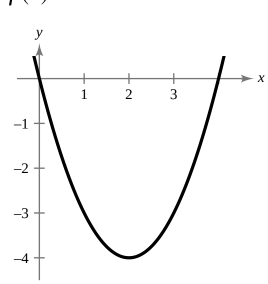
$4x + 2 \geq 0$

$4x \geq -2$

$x \geq -\frac{1}{2}$

$\left[-\frac{1}{2}, \infty\right)$

76. $f(x) = x^2 - 4x$



$f(x) \geq 0$

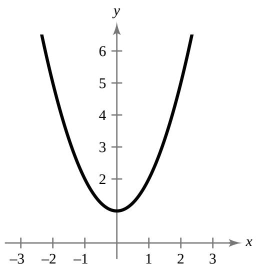
$x^2 - 4x \geq 0$

$x(x - 4) \geq 0$

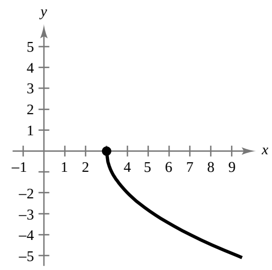
$(-\infty, 0], [4, \infty)$

78. $f(x) = x^2 + 1 \geq 0$ for all x.

$(-\infty, \infty)$



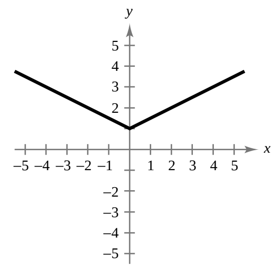
80. $f(x) = -2\sqrt{x-3} \geq 0$ for $x = 3$ only.



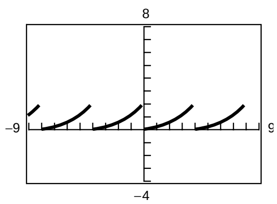
82. $f(x) = \frac{1}{2}(2 + |x|)$

$= 1 + \frac{1}{2}|x| \geq 0$ for all x.

$(-\infty, \infty)$



84. $g(x) = 2\left(\frac{1}{4}x - \left[\!\left[\frac{1}{4}x\right]\!\right]\right)^2$



Domain: $(-\infty, \infty)$

Range: $[0, 2)$

Pattern: Sawtooth

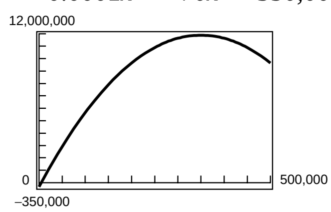
86. $p = 100 - 0.0001x$

$C = 350{,}000 + 30x$

$P = R - C = xp - C = x(100 - 0.0001x) - (350{,}000 + 30x)$

$= x(100 - 0.0001x) - 350{,}000 - 30x$

$= -0.0001x^2 + 70x - 350{,}000$



Maximum at 350,000 units

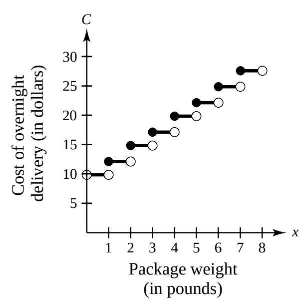
88. *Model*: (Total cost) = (Flat rate) + (Rate per pound)

Labels: Total cost = C

Flat rate = 9.80

Rate per pound = $2.50[\![x]\!]$, $x > 0$

Equation: $C = 9.80 + 2.50[\![x]\!]$, $x > 0$



90. $h = \text{top} - \text{bottom}$

$= 3 - (4x - x^2)$

$= 3 - 4x + x^2,$

$0 \leq x \leq 1$

92. $h = \text{top} - \text{bottom}$

$= 2 - \sqrt[3]{x},$

$0 \leq x \leq 8$

94. $L = \text{right} - \text{left}$

$= 2 - \sqrt[3]{2y},$

$0 \leq y \leq 4$

96.

Interval	*Intake Pipe*	*Drainpipe 1*	*Drainpipe 2*
[0, 5]	Open	Closed	Closed
[5, 10]	Open	Open	Closed
[10, 20]	Closed	Closed	Closed
[20, 30]	Closed	Closed	Open
[30, 40]	Open	Open	Open
[40, 45]	Open	Closed	Open
[45, 50]	Open	Open	Open
[50, 60]	Open	Open	Closed

98. False. The domain must be symmetric about the y-axis

100. $f(x) = a_{2n}x^{2n} + a_{2n-2}x^{2n-2} + \cdots + a_2x^2 + a_0$

$f(-x) = a_{2n}(-x)^{2n} + a_{2n-2}(-x)^{2n-2} + \cdots + a_2(-x)^2 + a_0$

$= a_{2n}x^{2n} + a_{2n-2}x^{2n-2} + \cdots + a_2x^2 + a_0 = f(x)$

$f(-x) = f(x)$; thus, $f(x)$ is even.

102. Yes, $x = y^2 + 1$ defines x as a function of y. (But not y as a function of x)

104. (a) $d = \sqrt{(6-(-2))^2 + (3-7)^2}$

$= \sqrt{64+16} = \sqrt{80} = 4\sqrt{5}$

(b) midpoint $= \left(\dfrac{-2+6}{2}, \dfrac{7+3}{2}\right) = (2, 5)$

106. (a) $d = \sqrt{\left(-\frac{3}{2} - \frac{5}{2}\right)^2 + (4-(-1))^2}$

$= \sqrt{16+25} = \sqrt{41}$

(b) midpoint $= \left(\dfrac{\frac{5}{2} - \frac{3}{2}}{2}, \dfrac{-1+4}{2}\right) = \left(\frac{1}{2}, \frac{3}{2}\right)$

108. $f(x) = 5x - 1$

(a) $f(6) = 5(6) - 1 = 29$

(b) $f(-1) = 5(-1) - 1 = -6$

(c) $f(x-3) = 5(x-3) - 1 = 5x - 16$

110. $f(x) = x\sqrt{x-3}$

(a) $f(3) = 3\sqrt{3-3} = 0$

(b) $f(12) = 12\sqrt{12-3}$

$= 12\sqrt{9} = 12(3) = 36$

(c) $f(6) = 6\sqrt{6-3} = 6\sqrt{3}$

112. $f(x) = x^2 - 2x + 9$

$f(3+h) = (3+h)^2 - 2(3+h) + 9 = 9 + 6h + h^2 - 6 - 2h + 9$

$= h^2 + 4h + 12$

$f(3) = 3^2 - 2(3) + 9 = 12$

$\dfrac{f(3+h) - f(3)}{h} = \dfrac{(h^2 + 4h + 12) - 12}{h} = \dfrac{h(h+4)}{h} = h + 4, h \neq 0$