Problem 3.

$y' = -2\sqrt{3}x + \sqrt{27} = \sqrt{3}(-2x+3)$; $0 = y' = \sqrt{3}(-2x+3) \Rightarrow x = \frac{3}{2}$ and $y\left(\frac{3}{2}\right) = -\sqrt{3}\left(\frac{3}{2}\right)^2 + \sqrt{27}\left(\frac{3}{2}\right) + 15 = \frac{9}{4}\sqrt{3} - 15$. As the coefficient of x^2 is negative, the vertex $\left(\frac{3}{2}, \frac{9}{4}\sqrt{3} + 15\right)$ is the highest point on the curve

Problem 6.

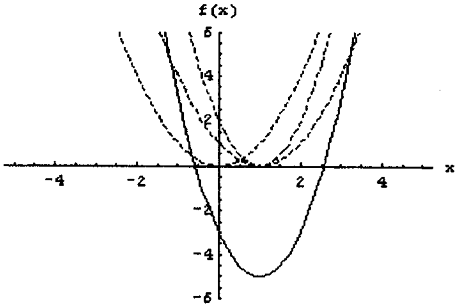
(a) As $f'(x) = 2x$, f is of the form $f(x) = x^2 + c$. (a) $f(0) = 0 \Rightarrow c = 0 \Rightarrow f(x) = x^2$. (b) $f(0) = 2 \Rightarrow c = 2 \Rightarrow f(x) = x^2 + 2$.

(b) As $f'(x) = -2x + 8$, f is of the form $f(x) = -x^2 + 8x + c$. (a) $f(0) = 0 \Rightarrow c = 0 \Rightarrow f(x) = -x^2 + 8x$. (b) $f(0) = 2 \Rightarrow c = 2 \Rightarrow f(x) = -x^2 + 8x + 2$.

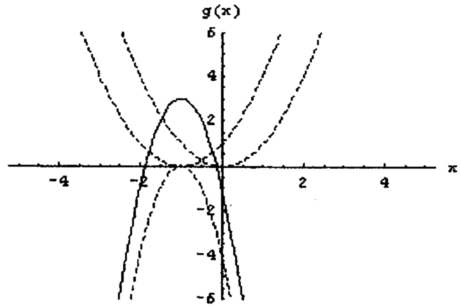
6.2

Problem 4.

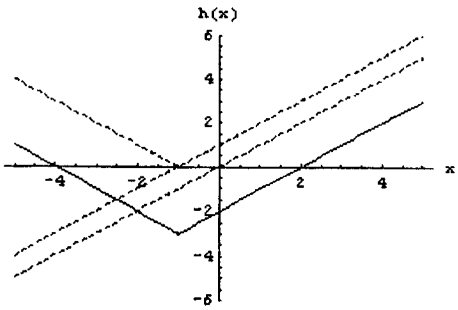
(a) Basic function: $q(x) = x^2$



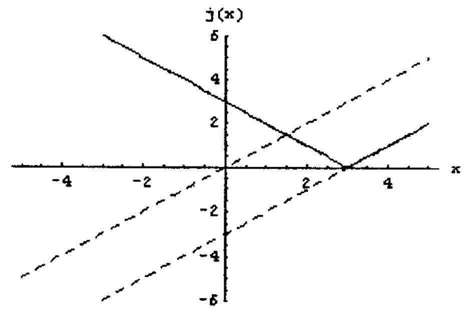
(b) Basic function: $q(x) = x^2$



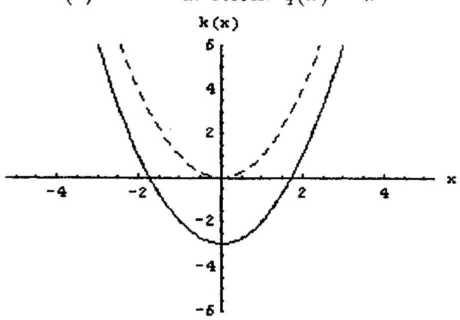
(c) Basic function: $a(x) = |x|$



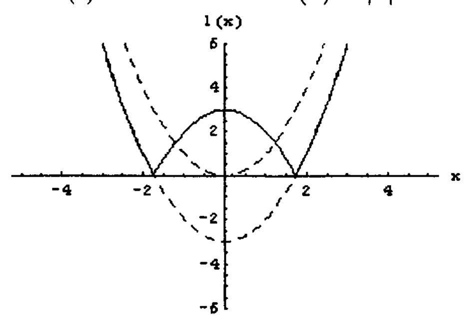
(d) Basic function: $a(x) = |x|$



(e) Basic function: $q(x) =$



(f) Basic function: $a(x) = |x|$



Problem 5.

(a) None: $2(x-3)^2 - 5 = -6 \Leftrightarrow 2(x-3)^2 = -1$. This last equation has no solutions because $2(x-3)^2 \geq 0 > -1$.

(b) Two: $-4(x+1)^2 + 3 = -6 \Leftrightarrow (x+1)^2 = \frac{9}{4} \Leftrightarrow x = -1 \pm \frac{3}{2} \Leftrightarrow x = \frac{1}{2}$ or $x = -\frac{5}{2}$.

(c) Two: $|x+1| - 3 = -2 \Leftrightarrow |x+1| = 1 \Leftrightarrow x = 0$ or $x = -2$.

(d) $x^2 - 3 \geq 1 \Leftrightarrow x^2 \geq 4 \Leftrightarrow x \leq -2$ or $x \geq 2$.

(e) Four solutions: $|x^2 - 3| = 1 \Leftrightarrow x^2 - 3 = 1$ or $x^2 - 3 = -1 \Leftrightarrow x^2 = 4$ or $x^2 = 2 \Leftrightarrow x = \pm 2$ or $x = \pm\sqrt{2}$.

Problem 6.

(a) True.

(b) False. The derivative of $h(x)$ does not exist at $x = -1$. The derivative of $j(x)$ does not exist at $x = 3$. The derivative of $l(x)$ does not exist at $x = \pm\sqrt{3}$.

Problem 7.

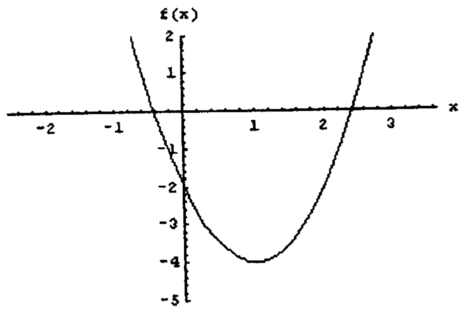
(a) Maximum at $x = 0$; minimum at $x = 3$

(b) Maximum at $x = 0$; minimum at $x = 4$

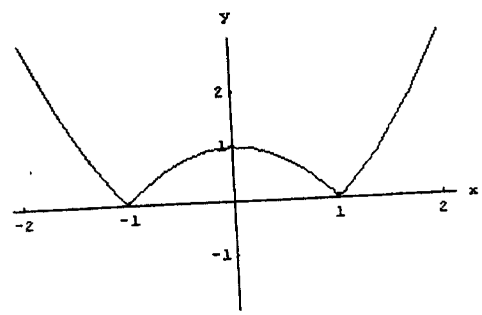
(c) Maximum at $x = 4$; minimum at $x = 0$

Section 6.3 Quadratics and Their Graphs

Problem 4.



Problem 5.



Problem 10.

From the point-slope form, we have $y - \pi = m(x - 0)$, where m is any constant. Thus, $f(x) = mx + \pi$ for any constant m.

Problem 11.

Lines with slope 2 have the form $y = 2x + b$. Thus, $f(x) = 2x + b$, for any constant b.

Problem 12.

The equation of such a parabola has the form $y = kx(x-3)$, where $k \neq 0$. Thus, $f(x) = kx(x-3) = kx(x-3)$, where $k \neq 0$.

Problem 14.

The equation a parabola with vertex $(2,3)$ has the form $y = a(x-2)^2 + 3$, where $a \neq 0$. Thus, $f(x) = a(x-2)^2 + 3$, where $a \neq 0$.