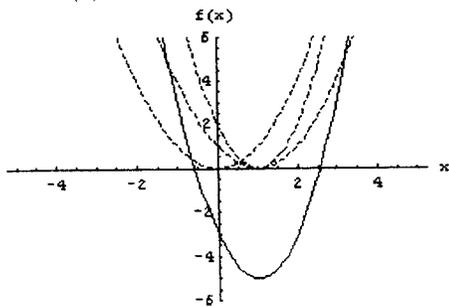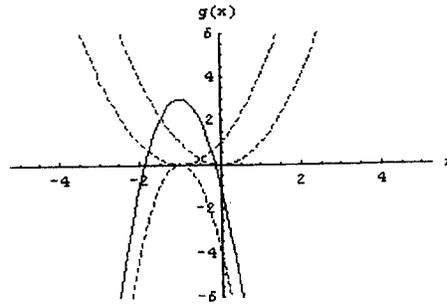QUADRATICS FROM A NON CALCULUS PERSPECTIVE
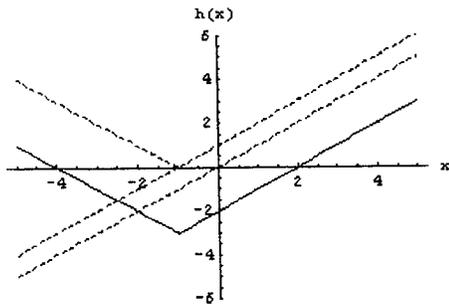
Problem 4.
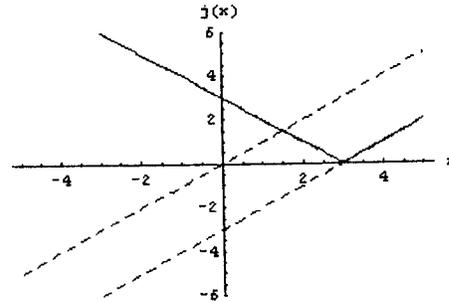
(a) Basic function: $q(x) = x^2$
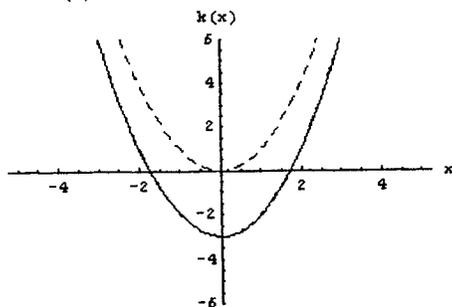

f(x)

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

g(x)

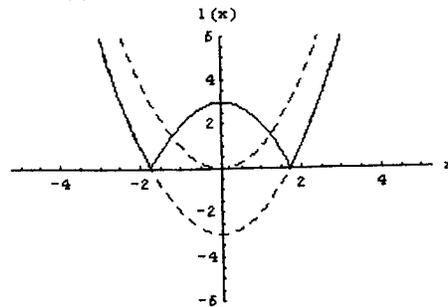(c) Basic function: $a(x) = |x|$

h(x)

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

j(x)

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

k(x)

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

l(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 $x = \pm\sqrt{3}$.
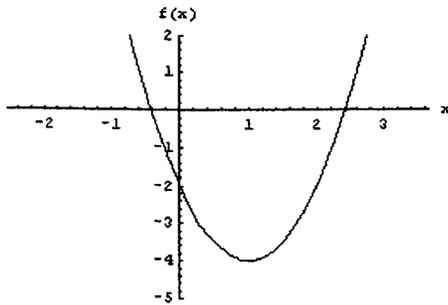
Problem 7.

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

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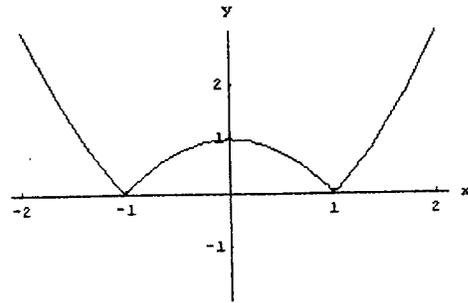
(c) Maximum at $x = 4$; minimum at $x = 0$

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 $a \neq 0$.

Section 7.2   Left- and Right-Handed Limits

Problem 10.

   (a) $\displaystyle\lim_{x \to -\infty} f(x) = 0$

   (b) $\displaystyle\lim_{x \to -7} f(x) = DNE$

   (c) $\displaystyle\lim_{x \to -5^+} f(x) = -1$

   (d) $\displaystyle\lim_{x \to -5} f(x) = DNE$

   (e) $\displaystyle\lim_{x \to -2} f(x) = 2$

   (f) $\displaystyle\lim_{x \to 2^+} f(x) = 1$

   (g) $\displaystyle\lim_{x \to \infty} f(x) = 1$

   (h) $\displaystyle\lim_{x \to 0} f(x) = 0$