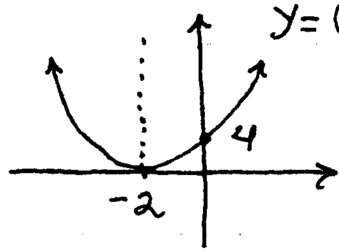
Section 4.2

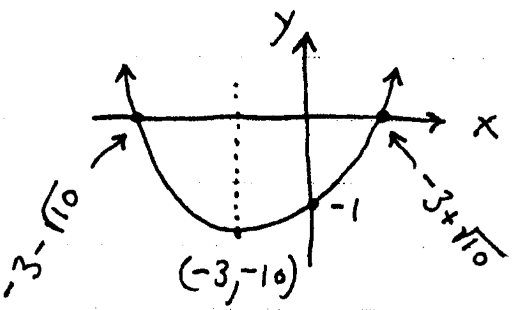
5) $y = (x+2)^2$



vertex : $(-2, 0)$,
axis of symmetry : $x = -2$,
minimum value : $y = 0$,

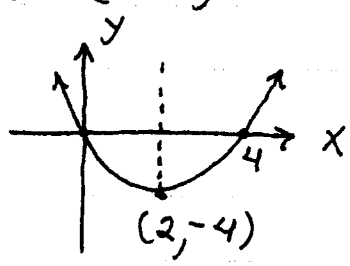
$x = 0 : \; y = 4$ and $y = 0 : \; x = -2$

10) $y = x^2 + 6x - 1 = (x^2 + 6x + 9) - 9 - 1 = (x+3)^2 - 10 \rightarrow$
$y = (x+3)^2 - 10$ then vertex : $(-3, -10)$,



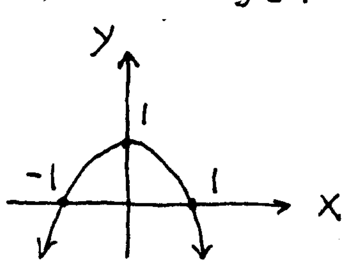
axis of symmetry : $x = -3$,
minimum value : $y = -10$,
$x = 0 : \; y = 9 - 10 = -1$,
$y = 0 : \; (x+3)^2 = 10 \rightarrow \; x+3 = \pm\sqrt{10} \rightarrow$
$x = -3 + \sqrt{10}$, $x = -3 - \sqrt{10}$

11) $y = x^2 - 4x = (x^2 - 4x + 4) - 4 = (x-2)^2 - 4 \rightarrow$
$y = (x-2)^2 - 4$ then vertex : $(2, -4)$,



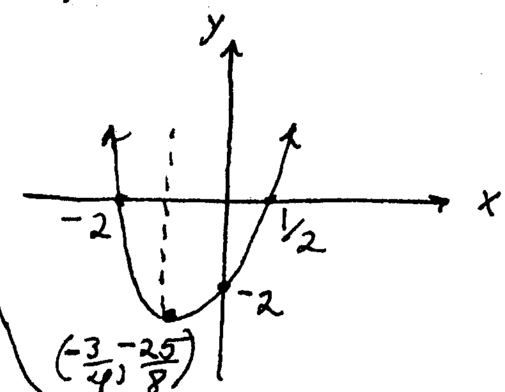
axis of symmetry : $x = 2$,
minimum value : $y = -4$,
$x = 0 : \; y = 0$, $y = 0 : \; (x-2)^2 = 4 \rightarrow$
$x - 2 = \pm 2 \rightarrow \; x = 4$, $x = 0$

13) $y = 1 - x^2 \rightarrow y = -(x-0)^2 + 1$,

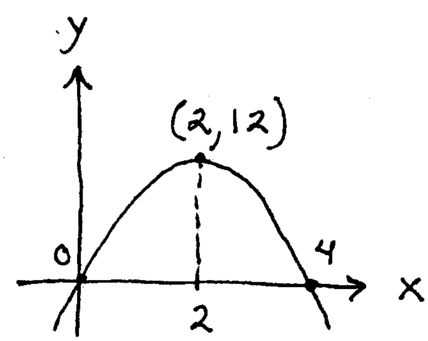


vertex : $(0, 1)$,
axis of symmetry : $x = 0$,
maximum value : $y = 1$,
$x = 0 : \; y = 1$, $y = 0 \rightarrow \; x^2 = 1 \rightarrow$
$x = 1$, $x = -1$

16) $y = 2x^2 + 3x - 2 = 2\left(x^2 + \frac{3}{2}x\right) - 2$
$= 2\left(x^2 + \frac{3}{2}x + \frac{9}{16}\right) - \frac{9}{8} - 2 = 2\left(x + \frac{3}{4}\right)^2 - \frac{25}{8}$ so
vertex: $\left(-3/4, -25/8\right)$,
axis of symmetry: $x = -3/4$,
minimum value: $y = -25/8$,
$x = 0$: $y = 2\left(\frac{9}{16}\right) - \frac{25}{8} = \frac{-16}{8} = -2$,
$y = 0$: $2\left(x + 3/4\right)^2 = 25/8 \rightarrow \left(x + 3/4\right)^2 = 25/16 \rightarrow$
$x + 3/4 = \pm 5/4 \rightarrow x = -2,\ x = +1/2$



18) $y = -3x^2 + 12x \rightarrow$
$y = -3(x^2 - 4x)$
$= -3(x^2 - 4x + 4) + 12$
$= -3(x - 2)^2 + 12$,
vertex: $(2, 12)$,
axis of symmetry: $x = 2$,
maximum value: $y = 12$,
$x = 0$: $y = 0$,
$y = 0$: $-3x(x - 4) = 0 \rightarrow$
$x = 0,\ x = 4$



23) $y = x^2 - 8x + 3 = (x^2 - 8x + 16) - 16 + 3$
$= (x - 4)^2 - 13$ so minimum value
is $y = -13$.

28) $y = \frac{-1}{3}x^2 - 2x = \frac{-1}{3}(x^2 + 6x)$
$= \frac{-1}{3}(x^2 + 6x + 9) + 3$ so maximum value
is $y = 3$. $\quad = \frac{-1}{3}(x + 3)^2 + 3$

36) $y = \frac{-1}{2}x^2 + 4x = \frac{-1}{2}(x^2 - 8x) = \frac{-1}{2}(x^2 - 8x + 16) + 8$
$= \frac{-1}{2}(x-4)^2 + 8$ so vertex is $(4,8)$;
$y = 2x^2 - 8x - 1 = 2(x^2 - 4x) - 1 = 2(x^2 - 4x + 4) - 8 - 1$
$= 2(x-2)^2 - 9$ so vertex is $(2,-9)$;
Dist. $= \sqrt{(4-2)^2 + (8-(-9))^2} = \sqrt{4+289} = \sqrt{293}$

43) a.) $f(x) = \sqrt{x^2 - 6x + 73} = \sqrt{(x^2 - 6x + 9) - 9 + 73}$
$= \sqrt{(x-3)^2 + 64}$ so if $x = 3$ then
$f(3) = \sqrt{0 + 64} = 8$ is minimum value.

c.) $h(x) = x^4 - 6x^2 + 73 = (x^2)^2 - 6(x^2) + 73$
$= [(x^2)^2 - 6(x^2) + 9] - 9 + 73 = [(x^2) - 3]^2 + 64$
so if $x = \pm\sqrt{3}$ then $h(\pm\sqrt{3}) = 9 - 6(3) + 73$
$= -9 + 73 = 64$ is minimum value.

46) c.) $H(x) = 27x^2 - x^4 = -x^4 + 27x^2$
$= -(x^4 - 27x^2) = -((x^2)^2 - 27(x^2) + \frac{729}{4}) + \frac{729}{4}$
$= -((x^2) - \frac{27}{2}) + \frac{729}{4}$ so maximum
value of $H(x)$ is $\frac{729}{4}$.

57) Since vertex is $(2,2)$ and graph passes through $(0,0)$ the equation is:
$y = a(x-h)^2 + k \rightarrow y = a(x-2)^2 + 2 \rightarrow$ (let $(x,y) = (0,0)$) $0 = a(0-2)^2 + 2 = 4a + 2 \rightarrow a = -\frac{1}{2} \rightarrow$
$y = \frac{-1}{2}(x-2)^2 + 2$

58) $y = x^2 \rightarrow$ (translate 4 left)

$y = (x+4)^2 \rightarrow$ (translate 3 up)

$$y = (x+4)^2 + 3 .$$

59) $y = a(x-h)^2 + k \rightarrow$ (vertex: $(3,-1)$)

$y = a(x-3)^2 - 1 \longrightarrow$ (x-intercept: $(1,0)$

$0 = a(1-3)^2 - 1 = 4a - 1 \rightarrow a = 1/4 \longrightarrow$

$$y = \frac{1}{4}(x-3)^2 - 1 .$$

60) $y = a(x-h)^2 + k \rightarrow$ (axis: $x = 1$)

$y = a(x-1)^2 + k \rightarrow$ (only one x-int.: $(1,0)$)

$0 = a(1-1)^2 + k \rightarrow k = 0 \rightarrow y = a(x-1)^2 \rightarrow$

(y-int.: $(0,1)$) $1 = a(0-1)^2 = a \rightarrow$

$$y = (x-1)^2$$