2.3

103. $(2t^2+t)^2-4(2t^2+t)+3=0$

$u=2t^2+t$

$u^2-4u+3=0$

$(u-3)(u-1)=0$

$u=3,1$

$2t^2+t=3$

$2t^2+t-3=0$

$(2t+3)(t-1)=0$

$t=-3/2, 1$

$2t^2+t=1$

$2t^2+t-1=0$

$(2t-1)(t+1)=0$

$t=1/2, -1$

2.4

$f(x)=a(x-h)^2+k$

Vertex $=(h,k)$

3. $f(x)=x^2-8x+12$

$=(x^2-8x+16)+12-16$

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

vertex: $(4,-4)$

axis of symmetry $x=4$

minimum: -4

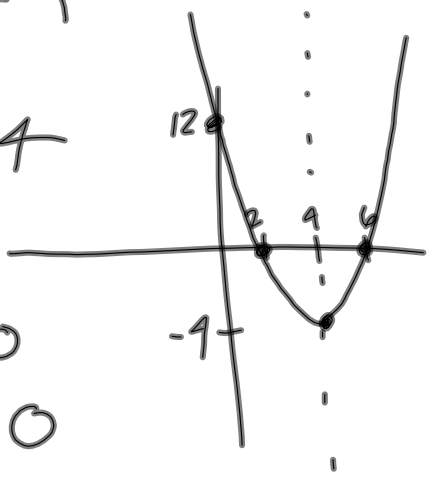
y-int: $(0,12)$

x-int: $x^2-8x+12=0$

$(x-2)(x-6)=0$

$x=2, x=6$

$(2,0)$ & $(6,0)$



Section 2.4 continued...

$f(x) = ax^2 + bx + c$ VERSUS $f(x) = a(x-h)^2 + k$

$= a\left(x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2\right) + c - a\left(\frac{b}{2a}\right)^2$ Vertex: (h,k)

$f(x) = a\left(x + \frac{b}{2a}\right)^2 + \frac{4ac-b^2}{4a}$

$\frac{4a}{4a} \cdot c - \frac{b^2}{4a}$

vertex: $\left(\frac{-b}{2a}, \frac{4ac-b^2}{4a}\right)$

$\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

$a=3 \quad b=-1 \quad c=5$

$f(x) = 3x^2 - x + 5$

vertex: $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

x-coord: $\frac{-(-1)}{2(3)} = \frac{1}{6}$

$= \left(\frac{1}{6}, \frac{59}{12}\right)$

y-coord: $f\left(\frac{1}{6}\right) = 3\left(\frac{1}{6}\right)^2 - \left(\frac{1}{6}\right) + 5$

$= 3 \cdot \frac{1}{36} - \frac{1}{6} + 5 \cdot \frac{12}{12} = \frac{1}{12} - \frac{2}{12} + \frac{60}{12} = \frac{59}{12}$

$f(x) = -2x^2 + x - 4$

$\left(\frac{1}{4}, \frac{-31}{8}\right)$

$\frac{-b}{2a} = \frac{-1}{2(-2)} = \frac{1}{4}$

$f\left(\frac{-b}{2a}\right) = -2\left(\frac{1}{4}\right)^2 + \frac{1}{4} - 4$

$= -2\left(\frac{1}{16}\right) + \frac{1}{4}\cdot\frac{2}{2} - 4\cdot\frac{8}{8}$

$= \frac{-1}{8} + \frac{2}{8} - \frac{32}{8} = \frac{-31}{8}$

42. Height of a Rocket

$s(t) = -16t^2 + 150t + 40$

determine time @ which rocket reaches max height & find that max height.

vertex (h, k) h = time, k = max height

time: $\frac{-b}{2a} = \frac{-150}{2(-16)} = \frac{75}{16}$ s $= 4.6875$ s

max height:

$s\left(\frac{75}{16}\right) = -16\left(\frac{75}{16}\right)^2 + 150\left(\frac{75}{16}\right) + 40 =$ 391.5625 ft

48. maximizing profit

profit = revenue − cost

$P(x) = R(x) - C(x)$

x = # of units sold

find max profit & # of units that must be sold to yield max profit.

$R(x) = 5x$; $C(x) = 0.001x^2 + 1.2x + 60$

$P(x) = 5x - (0.001x^2 + 1.2x + 60)$

$P(x) = -0.001x^2 + 3.8x - 60$

x-coord = # units; y-coord = profit

$\#\text{units} = \frac{-b}{2a} = \frac{+3.800}{2(+.0001)} =$ 1900 units

max profit $= -.0001(1900)^2 + 3.8(1900) - 60$

$=$ \$3550

HW

2.4

#35, 37, 43, 49