2.3

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

$u=2t^2+t$

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

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

$u=3,1$

$2t^2+t=3$ $\qquad$ $2t^2+t=1$

$2t^2+t-3=0$ $\qquad$ $2t^2+t-1=0$

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

$2t=-3$

$\boxed{t=-\frac{3}{2}}$ $\quad$ $\boxed{t=1}$ $\qquad$ $\boxed{t=\frac{1}{2}}$ $\quad$ $\boxed{t=-1}$

1.6

45. $f(x)=3x^2-2x+1$

Difference quotient of f:

$$\frac{f(x+h)-f(x)}{h}$$

$$\frac{3(x+h)^2-2(x+h)+1-(3x^2-2x+1)}{h}$$

$$=\frac{3(x^2+2xh+h^2)-2x-2h+1-3x^2+2x-1}{h}$$

$$=\frac{\cancel{3x^2}+6xh+3h^2\cancel{-2x}-2h\cancel{+1}\cancel{-3x^2}\cancel{+2x}\cancel{-1}}{h}$$

$$=\frac{\cancel{h}(6x+3h-2)}{\cancel{h}}=\boxed{6x+3h-2}$$

2.4

13. $g(x) = -2x^2 + 2x + 1$

a) vertex
b) axis of sym.
c) max/min
d) graph

$= -2\left(x^2 - x + \left(\frac{-1}{2}\right)^2\right) + 1 + \left[2\left(\frac{-1}{2}\right)^2\right]$

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

$= -2\left(x - \frac{1}{2}\right)^2 + \frac{3}{2} + \frac{1}{2}$

$g(x) = -2\left(x - \frac{1}{2}\right)^2 + \frac{3}{2}$

a) Vertex: $\left(\frac{1}{2}, \frac{3}{2}\right)$

b) axis of symm: $x = \frac{1}{2}$

c) max: $3/2$

[range: $(-\infty, 3/2]$]

y-int: $(0,1)$

x-int: $-2x^2 + 2x + 1 = 0$

$-2\left(x - \frac{1}{2}\right)^2 + \frac{3}{2} = 0$

$-2\left(x - \frac{1}{2}\right)^2 = -\frac{3}{2}$

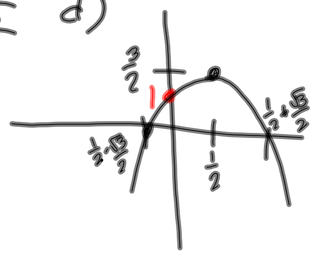
$\left(x - \frac{1}{2}\right)^2 = \frac{3}{4}$

$x - \frac{1}{2} = \pm\frac{\sqrt{3}}{2}$

$x = \frac{1}{2} \pm \frac{\sqrt{3}}{2}$

$\left(\frac{1}{2} + \frac{\sqrt{3}}{2}, 0\right)$ & $\left(\frac{1}{2} - \frac{\sqrt{3}}{2}, 0\right)$

d)



2.4 cont

$f(x) = ax^2 + bx + c$

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

$= a\left(x^2 + \frac{b}{a}x \quad\right) + c$

vertex: (h,k)

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

$\frac{b^2}{4a}$

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

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

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

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

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

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

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

$= \frac{1}{12} - \frac{2}{12} + \frac{60}{12}$

$= \frac{59}{12}$

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

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

vertex = ? $\boxed{\left(\frac{1}{4}, -\frac{31}{8}\right)}$

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

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

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

$= -\frac{31}{8}$

42. Height of a Rocket

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

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

$(t, s(t))$ time: $\frac{-150}{2(-16)} = \frac{75}{16} \approx 4.6875$ sec

max height: $-16\left(\frac{75}{16}\right)^2 + 150\left(\frac{75}{16}\right) + 40$

≈ 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.

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

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

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

max profit: y-coord of vertex

units: x-coord of vertex

units: $\frac{-3.800}{2(-0.001)} = 1900$ units

max profit: $P(1900) = -0.001(1900)^2 + 3.8(1900) - 60$

$= \$3550$

Hw

2.4

#35, 37, 43, 49