Assignment #6

§1.6 #44, 46, 48

#44

D: $p = -2q + 320$

S: $p = 8q + 2$

$-2q + 320 = 8q + 2$

$318 = 10q$

$\frac{318}{10} = q$

sub into D:

$p = -2\left(\frac{318}{10}\right) + 320$

$= -\frac{318}{5} + 320$

$= \frac{1282}{5}$

$\therefore \left(\frac{318}{10}, \frac{1282}{5}\right)$ is the market equilibrium

#46

D: $p = 480 - 3q$

S: $p = 17q + 80$

$480 - 3q = 17q + 80$

$400 = 20q$

$20 = q$

sub into D:

$p = 480 - 3(20)$

$p = 420$

$\therefore$ the market equilibrium is $(20, 420)$

#48 D: $(45, 10)$, $(20, 60)$

S: $(35, 30)$, $(70, 50)$

$p = m_d q + b_d$

$p = -2q + b_d$

$10 = -2(45) + b_d$

$100 = b_d$

$m_d = \frac{60 - 10}{20 - 45} = -2$

$\therefore D: p = -2q + 100$

$p = m_s q + b_s$

$m_s = \frac{50-30}{70-35} = \frac{20}{35} = \frac{4}{7}$

$p = \frac{4}{7}q + b_s$

$30 = \frac{4}{7}(35) + b_s$

$30 = 20 + b_s$

$10 = b_s$

$\therefore S: \ p = \frac{4}{7}q + 10$

Finding the market equilibrium.

$$\frac{4}{7}q + 10 = -2q + 100$$

$$4q + 70 = -14q + 700$$

$$18q = 630$$

$$q = 35$$

Sub into S: to find p

$$p = \frac{4}{7}(35) + 10$$

$$p = 4(5) + 10$$

$$p = 30$$

$\therefore (35, 30)$ is the equilibrium point.

Section 2.1 # 2, 4, 6, 8, 12, 18, 20, 22, 24, 26, 28

#2 $x^2 - 2x + 5 = 2 - 2x^2$

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

#4 $(z-1)(z-3) = 1$

$z^2 - 4z + 3 = 1$

$z^2 - 4z + 2 = 0$

#6 $25x^2 - 16 = 0$

$(5x-4)(5x+4) = 0$

$5x-4=0$ | $5x+4=0$

$5x = 4$ | $5x = -4$

$x = \frac{4}{5}$ | $x = \frac{-4}{5}$

#8 $t^2 - 4t = 3t^2$

$-2t^2 - 4t = 0$

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

$-2t=0$ | $t+2=0$

$t = 0$ | $t = -2$

#12 $49z^2 + 14z + 1 = 0$

$(7z+1)(7z+1) = 0$

$7z+1=0$

$7z = -1$

$z = \frac{-1}{7}$

#18 $\frac{x}{x-2} - 1 = \frac{3}{x+1}$ LCD $= (x-2)(x+1)$

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

$x^2 + x - [x^2 - x - 2] = 3x - 6$

$x^2 + x - x^2 + x + 2 = 3x - 6$

$8 = x$

verify sol:

$x-2$: $8-2 \neq 0$

$x+1$: $8+1 \neq 0$

$\therefore$ valid solution

#20

$$\frac{5}{z+4} - \frac{3}{z-2} = 4 \qquad LCD = (z+4)(z-2)$$

$$\frac{5(z+4)(z-2)}{(z+4)} - \frac{3(z+4)(z-2)}{(z-2)} = 4(z+4)(z-2)$$

$$5(z-2) - 3(z+4) = 4[z^2+2z-8]$$

$$5z-10-3z-12 = 4z^2+8z-32$$

$$0 = 4z^2+6z-10 \qquad 4z^2(-10) = -40z^2 = ab$$

$$0 = 4z^2+10z-4z-10 \qquad \text{s.t } a+b = 6z$$

$$0 = 2z(2z+5)-2(2z+5) \qquad 10z-4z = 6z$$

$$0 = (2z+5)(2z-2)$$

$2z+5=0$ $\qquad$ $2z-2=0$

$z = -\frac{5}{2}$ $\qquad$ $z=1$

Verify solution

	$z=-\frac{5}{2}$	$z=1$
$z+4$:	$\neq 0$	$\neq 0$
$z-2$:	$\neq 0$	$\neq 0$

$\therefore$ $z=-\frac{5}{2}, 1$ valid solutions.

#22 $x^2-6x+7=0$

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{-(-6) \pm \sqrt{(-6)^2-4(1)(7)}}{2(1)}$$

$$= \frac{6 \pm \sqrt{8}}{2} \doteq 4.41 \text{ and } 1.59$$

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$$z^2 + 2z + 4 = 0$$

$$z = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-2 \pm \sqrt{2^2 - 4(1)(4)}}{2}$$

$$= \frac{-2 \pm \sqrt{-12}}{2}$$ ← since negative, no solutions

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$$10y^2 - y - 65 = 0$$

$$y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-1) \pm \sqrt{(-1)^2 - 4(10)(-65)}}{2(10)}$$

$$= \frac{1 \pm \sqrt{2601}}{20}$$

$$= \frac{1 \pm 51}{20}$$

$\doteq -2.5$ and 2.6

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$$3x^2 = -6x - 2$$

$$0 = 3x^2 + 6x + 2$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-6 \pm \sqrt{36 - 4(3)(2)}}{2(3)}$$

$$= \frac{-6 \pm \sqrt{12}}{6}$$

$\doteq -1.58$ and -0.42

Section 2.2:

#2 $y = x^2 - 2x$

a) Vertex:

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

$$= \left(\frac{-(-2)}{2(1)}, f\left(\frac{-(-2)}{2(1)}\right)\right)$$

$$= (1, f(1))$$

$$= (1, 1^2 - 2(1))$$

$$= (1, -1)$$

Orientation: $a = 1 > 0$ ↺

b) ∴ vertex a minimum

c) $x = 1$

d) $y = -1$

#4 $y = 6 - 4x - 2x^2$

$y = -2x^2 - 4x + 6$

Vertex:

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

$$= \left(\frac{-(-4)}{2(-2)}, f\left(\frac{-(-4)}{2(-2)}\right)\right)$$

$$= (-1, f(-1))$$

$$= (-1, -2(-1)^2 - 4(-1) + 6)$$

$$= (-1, -2 + 4 + 6)$$

$$= (-1, 8)$$

Orientation: $a = -2 < 0$ ↻

b) ∴ vertex a maximum

c) $x = -1$

d) $y = 8$

#8 $y = -2x^2 + 18x$

Vertex:

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

$$= \left(\frac{-18}{2(-2)}, f\left(\frac{-18}{2(-2)}\right)\right)$$

$$= \left(\frac{9}{2}, f\left(\frac{9}{2}\right)\right)$$

$$= \left(\frac{9}{2}, -2\left(\frac{9}{2}\right)^2 + 18\left(\frac{9}{2}\right)\right)$$

$$= \left(\frac{9}{2}, \frac{81}{2}\right)$$

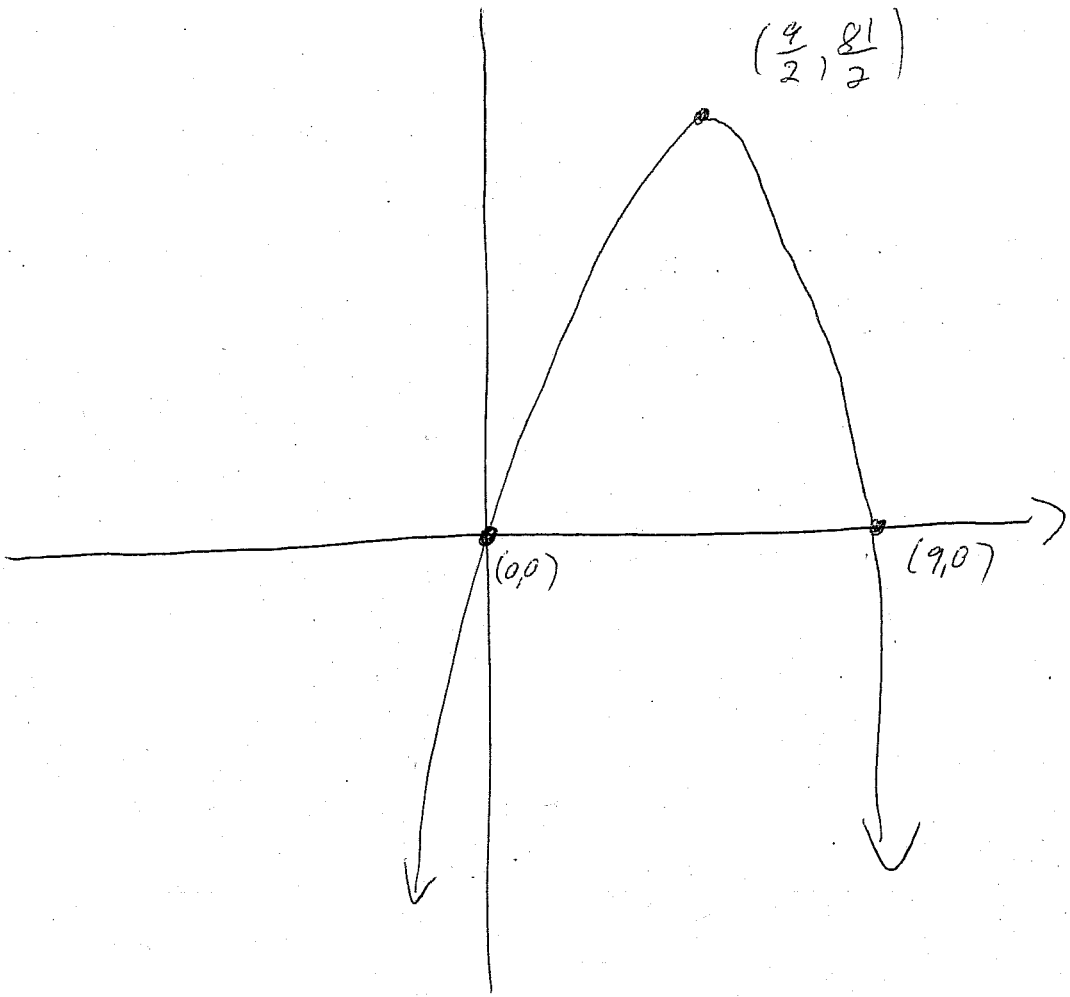
y-int: $(0, c) = (c, 0)$

x-int: $0 = -2x^2 + 18x$

$0 = -2x(x - 9)$

$-2x = 0$ | $x - 9 = 0$

$x = 0$ | $x = 9$


$\left(\frac{9}{2}, \frac{81}{2}\right)$
(0,0)
(9,0)