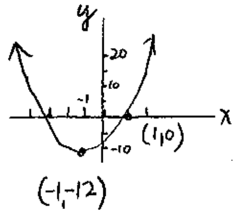
MATH 1050 – Review for Exam 3, 6

3.1 (40)



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

$y = a(x+1)^2 - 12 \Rightarrow$ $\boxed{y = 3(x+1)^2 - 12 \text{ OR } y = 3x^2 + 6x - 9}$

$0 = a(1+1)^2 - 12$

$12 = 4a$

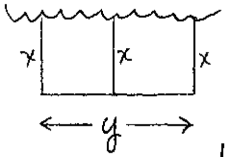
$3 = a$

(60) $h(x) = -\frac{1}{3}x^2 + \frac{4}{3}x + 4$

a) Maximum height at vertex: $h = \frac{-b}{2a} = \frac{-4/3}{2(-1/3)} = 2 \text{ ft}$

b) $h(2) = -\frac{1}{3}(2)^2 + \frac{4}{3}(2) + 4 = \frac{16}{3}$ OR $5\frac{1}{3}$ ft

(56)



$3x + y = 600$ ft

a) $y = 600 - 3x$

b) $A = xy$

$A = x(600 - 3x) = 600x - 3x^2$

$0 < x < 200$

c) $22{,}500 = 600x - 3x^2$

$3x^2 - 600x + 22{,}500 = 0$

$x^2 - 200x + 7{,}500 = 0$

$(x-50)(x-150) = 0$

$\boxed{x = 50', y = 450'}$ OR $\boxed{x = 150', y = 150'}$

d) Maximum Area is at Vertex.

$h = \frac{-b}{2a} = \frac{-600}{2(-3)} = 100$

$A(100) = \boxed{30{,}000 \text{ ft}^2}$

3.2 (7) $\dfrac{x^5 + 3x^4 + 2x^3 + 2x^2 + 3x + 1}{x+2}$

-2	1	3	2	2	3	1
		-2	-2	0	-4	2
	1	1	0	2	-1	3

$\boxed{x^4 + x^3 + 2x - 1 + \frac{3}{x+2}}$

(24) $f(x) = 2x^4 + x^3 - 15x^2 + 3x$; $k = -3$

-3	2	1	-15	3	0
		-6	15	0	-9
	2	-5	0	3	-9

$f(x) = (x-k)q(x) + r$

$\boxed{f(x) = (x+3)(2x^3 - 5x^2 + 3) - 9}$

3.3 (29) $f(x) = x^3 - x^2 - 4x - 6$; 3 is a zero

3	1	-1	-4	-6
	1	2	2	0

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

$\frac{-2 \pm 2i}{2}$

$\boxed{-1 \pm i \text{ are the other 2 zeros}}$

(40) $f(x) = 15x^3 + 61x^2 + 2x - 8$

Possible Rational Zeros: $x = \pm \frac{1, 2, 4, 8}{1, 3, 5, 15}$

a) $x = \pm 1, 2, 4, 8, \frac{1}{3}, \frac{2}{3}, \frac{4}{3}, \frac{8}{3}, \frac{1}{5}, \frac{2}{5}, \frac{4}{5}, \frac{8}{5}, \frac{1}{15}, \frac{2}{15}, \frac{4}{15}, \frac{8}{15}$

b)

	15	61	2	-8
-1	15	46	-44	36
U.B. 2	15	91	184	360
-2	15	31	-60	112
* -4	15	1	-2	0

$15x^2 + x - 2 \rightarrow (5x+2)(3x-1)$

$\boxed{x = -\frac{2}{5}, \frac{1}{3}, -4}$

c) $f(x) = (5x+2)(3x-1)(x+4)$

(64) Zeros of -1 and $4 - 2i$

Complex zeros occur in Conjugate Pairs, Therefore $4 + 2i$ must also be a zero.

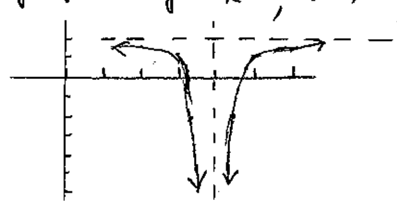
$(x+1)[x - (4-2i)][x - (4+2i)]$

$(x+1)(x - 4 + 2i)(x - 4 - 2i) \rightarrow$ $(x+1)(x^2 - 4x - 2ix - 4x + 16 + 8i + 2ix - 8i + 4)$

$(x+1)(x^2 - 8x + 20) = x^3 - 8x^2 + 20x + x^2 - 8x + 20 = x^3 - 7x^2 + 12x + 20$

3.5 (28) $f(x) = -\dfrac{1}{(x-4)^2} + 2$

Compared to the graph of $y = \frac{1}{x^2}$, $f(x)$ is Reflected about x-axis, and shifted Right 4 and Up 2



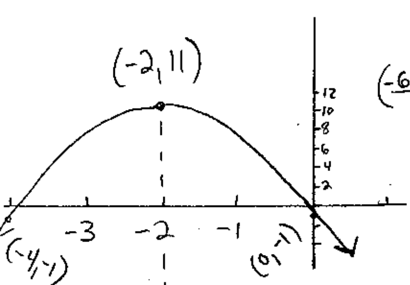
3.R (3) $f(x) = -3x^2 - 12x - 1$

Vertex at $h = \frac{-b}{2a} = \frac{12}{2(-3)} = -2$

$f(-2) = -3(-2)^2 - 12(-2) - 1 = 11$

Vertex: $(-2, 11)$

Axis of Symmetry: $x = -2$



X-Intercepts: $\left(\frac{-6-\sqrt{33}}{3}, 0\right) + \left(\frac{-6+\sqrt{33}}{3}, 0\right)$

$0 = -3x^2 - 12x - 1$

$x = \frac{12 \pm \sqrt{144 - 4(-3)(-1)}}{2(-3)} = \frac{12 \pm \sqrt{132}}{-6}$ ($\sqrt{132} = 2\sqrt{33}$)

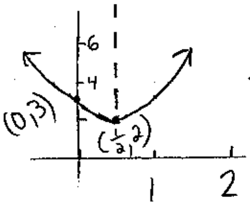
$x = \frac{-6 \pm \sqrt{33}}{3}$

y-Intercept	DOMAIN	RANGE
$(0, -1)$	$(-\infty, \infty)$	$(-\infty, 11]$

3.R (4) $f(x) = 4x^2 - 4x + 3$

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

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



Vertex: $(\frac{1}{2}, 2)$, Axis: $x = \frac{1}{2}$

x-INT: None y-INT: $(0,3)$

DOMAIN: $(-\infty, \infty)$ RANGE $[2, \infty)$

(88) $p = kqr^2$

$100 = k(2)(3)^2$

$100 = 18k$

$\frac{50}{9} = k$

$\Rightarrow p = \frac{50}{9} q r^2$

$p = \frac{50}{9}(5)(2)^2$

$p = \frac{1000}{9}$ OR $111.\bar{1}$

(90) $P = kd$

$60 = k(4)$

$15 = k$

$\Rightarrow P = 15d$

$P = 15(10)$

$P = 150 \frac{kg}{m^2}$

(91) $F = \frac{kwv^2}{r}$

$3000 = \frac{k(2000)30^2}{500}$

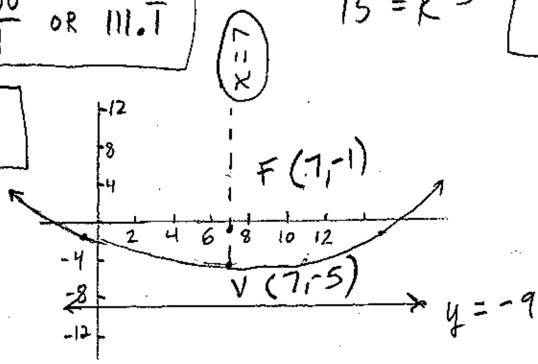
$\frac{5}{6} = k \Rightarrow F = \frac{\frac{5}{6} w v^2}{r}$

$F = \frac{\frac{5}{6}(2000)60^2}{800} = 7500 \text{ lbs}$

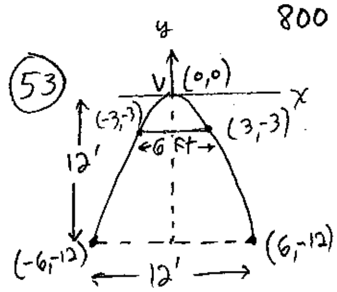
6.1 (29) $(x-7)^2 = 16(y+5)$

$4p = 16$

$p = 4$



(53)



$x^2 = 4py$

$6^2 = 4p(-12)$

$-\frac{3}{4} = p$

$4p = -3$

$x^2 = -3y$

$x^2 = -3(-3) = 9$

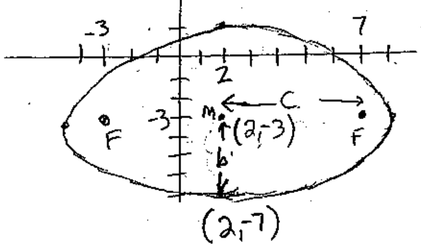
$x = \pm 3$

9 ft up means $y = -3$

Arch is 6 ft wide 9 ft above ground

6.2 (22) Foci $(-3,-3)$ + $(7,-3)$

$(2,-7)$ is on ellipse



Center at midpoint of Foci $= (2,-3)$ (h, k)

$c = 5$ $b = 4$ $a^2 = b^2 + c^2$

$a^2 = 4^2 + 5^2 = 41$

$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1 \Rightarrow \frac{(x-2)^2}{41} + \frac{(y+3)^2}{16} = 1$

(40) $x^2 + 25y^2 = 25$

$\Rightarrow \frac{x^2}{25} + \frac{y^2}{1} = 1 \Rightarrow a^2 = 25$, $b^2 = 1$

$a^2 = b^2 + c^2$

$25 = 1 + c^2$

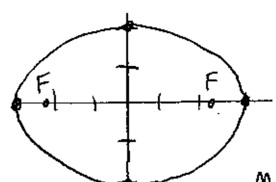
$24 = c^2$

$\Rightarrow c = \sqrt{24} = 2\sqrt{6}$

$e = \frac{c}{a} = \frac{2\sqrt{6}}{5} \approx .979796$

6.R (33) $4x^2 + 9y^2 = 36$

$\frac{4x^2}{36} + \frac{9y^2}{36} = \frac{36}{36} \Rightarrow \frac{x^2}{9} + \frac{y^2}{4} = 1$



DOMAIN $[-3,3]$ RANGE $[-2,2]$

Vertices $(-3,0)$ + $(3,0)$

Minor Endpoints $(0,-2)$ + $(0,2)$

Foci $(\pm\sqrt{5}, 0)$

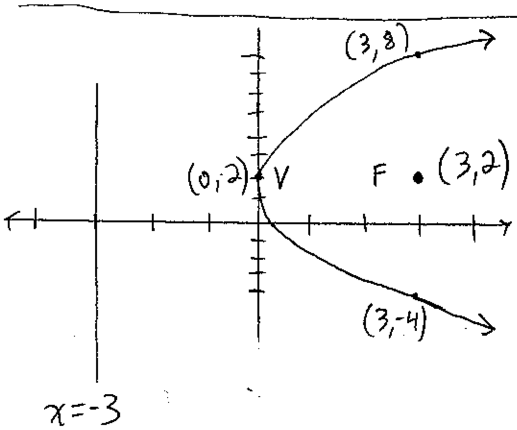
$a^2 = b^2 + c^2$

$9 = 4 + c^2$

$5 = c^2$

$\sqrt{5} = c$

(51) Focus at $(3,2)$ Directrix: $x = -3$



Vertex is halfway between focus + directrix $\Rightarrow (0,2)$

$(y-k)^2 = 4p(x-h)$

$(y-2)^2 = 4(3)(x-0)$

$(y-2)^2 = 12x$

p = distance from vertex to focus

$p = 3$