

## Midterm 1 – Review Problems (Answers)

- (1)  $f(2) = 0, f(-2) = 16, f(-x) = x^2 + 4x + 4, f(x+2) = x^2, f(x+h) = x^2 + h^2 + 2xh - 4x - 4h + 4$   
 (2)  $f(2) = 0.25, f(-2) = -0.25, f(-x) = \frac{-x}{x^2 + 4}, f(x+2) = \frac{x+2}{x^2 + 4x + 8}, f(x+h) = \frac{x+h}{x^2 + h^2 + 2xh + 4}$   
 (3)  $f(2) = f(-2) = -1, f(-x) = |x| - 3, f(x+2) = |x+2| - 3, f(x+h) = |x+h| - 3$   
 (4)  $f(2) = f(-2) = \text{undefined}, f(-x) = \sqrt{-x-5}, f(x+2) = \sqrt{x-3}, f(x+h) = \sqrt{x+h-5}$

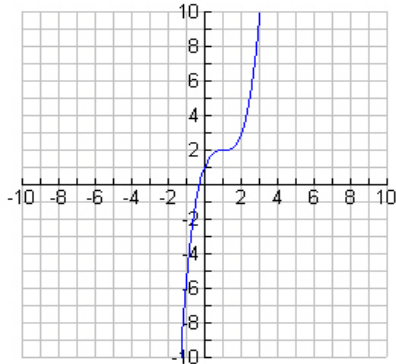
(5) Y (6) N (7) Y (8) Y

- (9) D= $(-\infty, \infty)$  R= $[0, \infty)$  Intercept (0,0)  
 (10) D= $[-3, 3)$  R= $[0, 3)$  Intercepts (0,0) and (-3,0)  
 (11) D= $(0, 2]$  R= $[0, 1]$  Intercept (1,0)  
 (12) D= $(-3, \infty)$  R= $[-1, \infty)$  Intercepts (0,2) and (-2,0)  
 (13) Increasing;  $(-\infty, -1.29) \cup [1.29, \infty)$  Decreasing  $[-1.29, 1.29]$   
 (14) Increasing;  $[-1.41, 0] \cup [1.41, \infty)$  Decreasing  $(-\infty, -1.41] \cup [0, 1.41]$

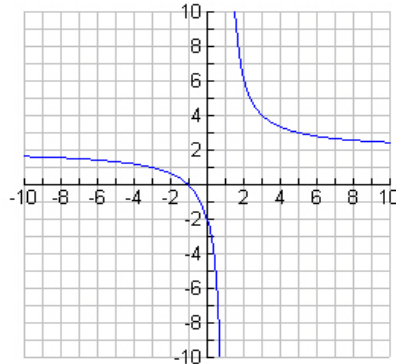
(15)  $\frac{1}{12t+4}$  (16)  $\frac{1-\sqrt{a+1}}{a\sqrt{a+1}}$

(17)  $|x+2|+3$  (18)  $-|x|-3$  (19)  $3|x-1|$  (20)  $|-(x-1)|$

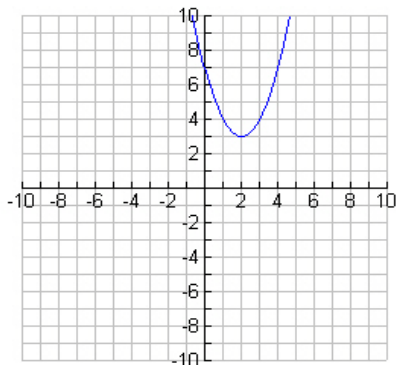
(21)



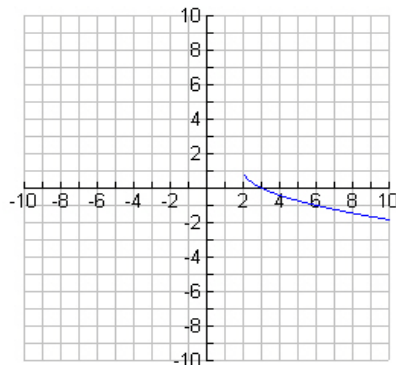
(22)



(23)



(24)



(25)  $f(1) = 2$  (26)  $f\left(\frac{5}{6}\right) = -\frac{247}{36}$

(27)  $A(x) = -x^2 + 7x$   $A_{\max} = 12.25$  (28)  $3.06 \times 4.66$  (29)  $[3,5) \cup (5, \infty)$

(30)  $f \circ g = \sqrt{\frac{2x+2}{2x+1}}$   $g \circ f = \frac{1}{2\sqrt{x+1}+1}$   $g \circ g = \frac{2x+1}{2x+3}$   $f \circ f = \sqrt{\sqrt{x+1}+1}$

(31)  $f(x) = \frac{x}{x+2}$   $g(x) = \sqrt{x}$ ; others possible

(32)  $f^{-1}(x) = \frac{x+1}{2}$  (33)  $f^{-1}(x) = \sqrt[3]{x-1}$  (34)  $f^{-1}(x) = \sqrt{x-2}$

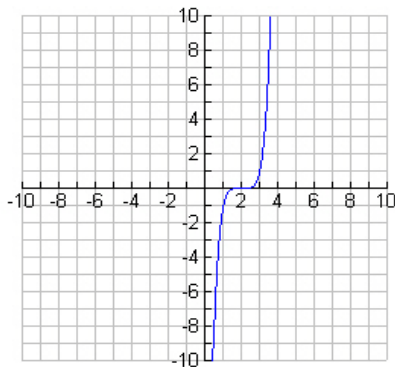
(35)  $f^{-1}(x) = \frac{1}{x} + 3$

Problem #		$f(x)$	$f^{-1}(x)$
(32)	Domain	All Real numbers	All Real numbers
	Range	All Real numbers	All Real numbers
(33)	Domain	All Real numbers	All Real numbers
	Range	All Real numbers	All Real numbers
(34)	Domain	$[0, \infty)$	$[2, \infty)$
	Range	$[2, \infty)$	$[0, \infty)$
(35)	Domain	$x \neq 3$	$x \neq 0$
	Range	$y \neq 0$	$y \neq 3$

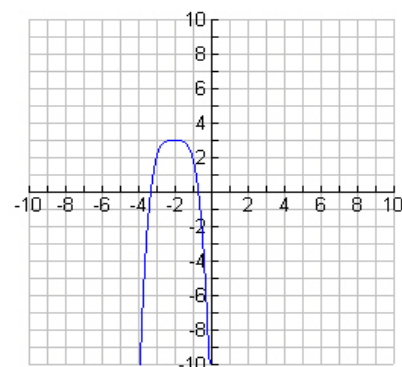
- (36) Minimum (0,0)      Decreasing (-2,0]      Increasing [0,2)  
 (37) Minimum (-1,0),(1,0) Maximum (0,1)      Decreasing (-2,-1] U [0,1)  
 Increasing [-1,0] U [1,2)  
 (38) Minimum (0,0)      Decreasing [-2,0]      Increasing [0,2)  
 (39) Minimum (0.578,-0.385)      Maximum (-0.578, 0.385)  
 Decreasing [-0.578,-.578]      Increasing [-2,-0.578]U[0.578,2)

(40)-(43) Graphing

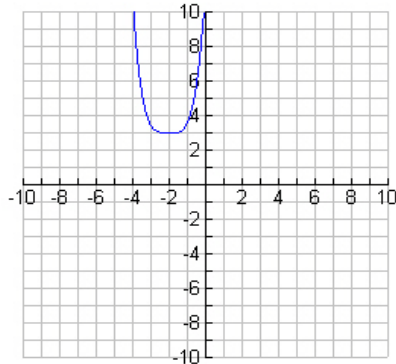
(40)



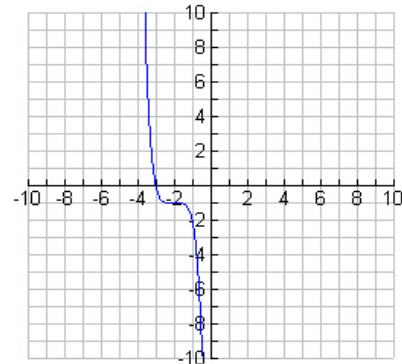
(41)



(42)



(43)



Problem #	(a) (multiplicity)	(b)	(c)	(e)
(44)	2 (1)	cross	$4x^3$	(-1,0)
	-1 (2)	touch		(1,16)
(45)	-1 (2)	touch	$x^4$	(-1,0)
(46)	0 (2)	touch	$-x^8$	(0,0)
	2 (1)	cross		(-0.95, 96.39)
	1 (5)	cross		(1.58, 2113.04)
(47)	$\sqrt{3}$ (2)	touch	$2x^4$	(-3,0)
	3 (2)	touch		(-0.63, 62.68)
				$(\sqrt{3}, 0)$

(48)  $\frac{11}{17} - \frac{10}{17}i$  (49) 1 (50)  $-i$  (51)  $P(x) = x^4 - 4x^3 + 6x^2 - 4x + 5$

(a)  $(x+1)(x-3)(x^2+1)$

(52) (b)  $(x+1)(x-3)(x+i)(x-i)$

(c)  $-1, 3, \pm i$

(a)  $(x+1)^2(x^2-2x+2)$

(53) (b)  $(x+1)^2[x-(1+i)][x-(1-i)]$

(c)  $-1, 1 \pm i$

Problem #	Intercepts	V.A.	H.A./O.A.	Symmetry
(54)	(0,0)	$x = 1, x = -1$	$y = 0$ (H.A.)	Origin
(55)	(0,-1)	$x = 2$	$y = x+2$ (O.A.)	None
(56)	(0,0) and (4,0)	$x = 1$	$y = 1$ (H.A.)	None
(57)	(3,0) and (0,1.5)	$x = 2$	$y = 1$ (H.A.)	None

(58)  $Q(x) = 2x^2 - 5x + 10, R(x) = -17$

(59)  $Q(x) = x^2 - 1, R(x) = 0$