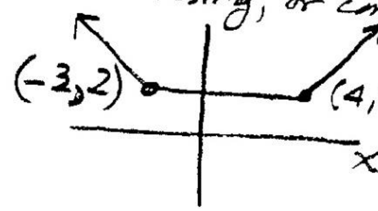
MAC 1140 EXAM 2B NAME ______________________

Show all work on this test or on separate paper.
Turn in <u>all</u> worksheets. Calculators are required.

1a) Sketch the graph of $y = \dfrac{x-3}{x^2-9}$.

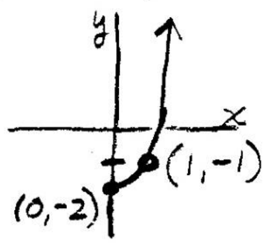
b) Identify discontinuities, and use to explain the difference between an asymptote and a hole in the graph.

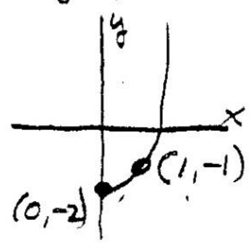
2. Give <u>intervals</u> in which the graph is increasing, decreasing, or constant.

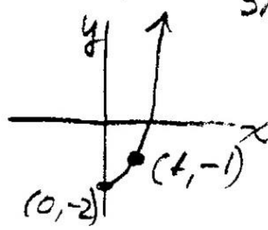


3. Sketch the graph and label the points if it is symmetric

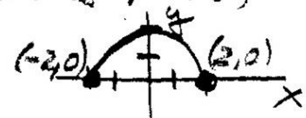
a) to x axis b) to y axis c) to origin







4. Given $y = f(x)$



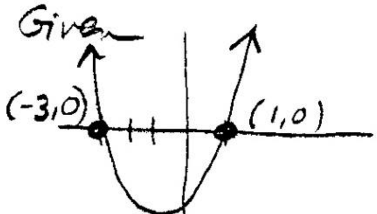
Sketch a) $y = f(x) + 2$

b) $y = f(x-2)$

c) $y = -f(x)$

d) $y = f(-x)$

5. Given

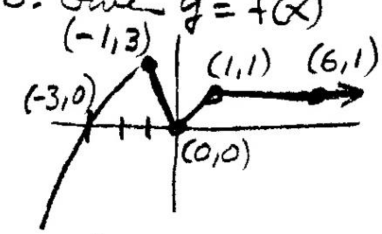


a) $f(x) = 0$ ______

b) $f(x) < 0$ ______

c) $f(x) \geq 0$ ______

6. Given $y = f(x)$



Sketch:

a) $y = -f(x)$

b) $y = f(-x)$

7. Use the graph in #6 to find:

a) $f(0) =$ ______

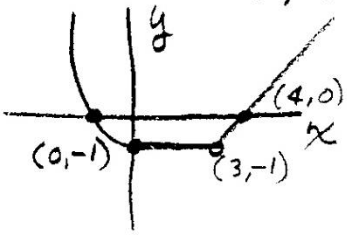
b) $f(4) =$ ______

c) $f(-1) =$ ______

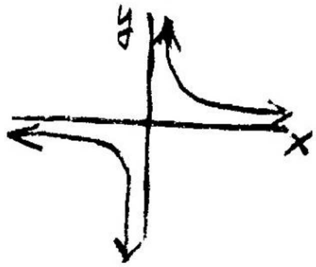
d) $6f(-1) =$ ______

8. Given $y=f(x)$, graph $y=|f(x)|$

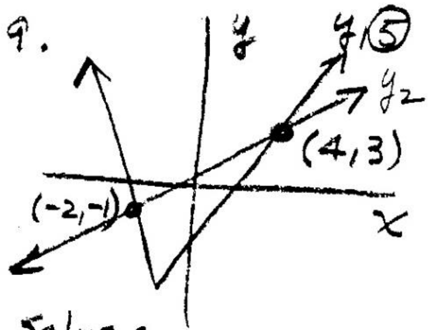
a)



b)



9.



Solve:

a) $y_1 = y_2$

b) $y_1 < y_2$

c) $y_1 > y_2$

10. Solve (explain method)

a) $|7x+12| = |x-4|$

b) $|7x+12| < |x-4|$

c) $|7x+12| > |x-4|$

11. Graph $y = [x]$

12. Graph $y = \begin{cases} \sqrt[3]{x} & \text{if } x<0 \\ \sqrt{x}+4 & \text{if } x \geq 0. \end{cases}$

$f(-8) =$ ___ $f(0) =$ ___ $f(4) =$ ___

13. Let $f(x) = 4x^2 - 3x$

$g(x) = -2x+4$

a) $(f \circ g)(x) =$

b) $(g \circ f)(x) =$

c) $(f \circ g)(2) =$

d) $(g \circ f)(2) =$

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

a) Find $f(x+h)$

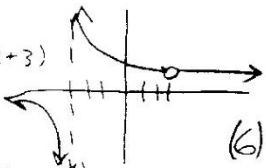
b) Find $f(x+h) - f(x)$

c) Find $\frac{f(x+h)-f(x)}{h}$ and simplify.

6 MAC 1140 EXAM 2B Solutions

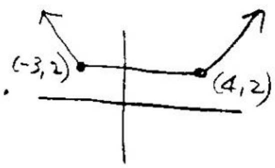
1. $y = \frac{x-3}{x^2-9} = \frac{\cancel{x-3}}{\cancel{(x-3)}(x+3)}$

Points $x \neq \pm 3$



(6) Discontinuous at $x = 3$ (Hole in graph) and $x = -3$ (Asymptote!)

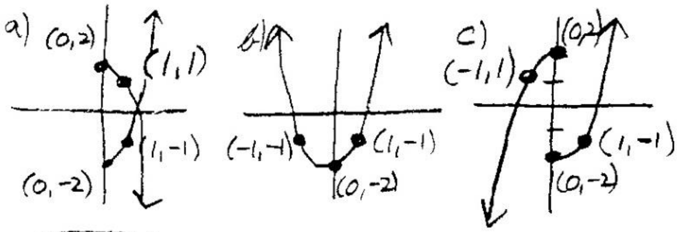
2.



(6) Increasing : $(4, \infty)$
Decreasing : $(-\infty, -3)$
Constant = $(-3, 4)$ or $[-3, 4]$

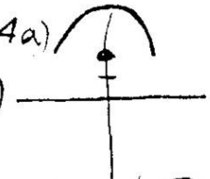
3. a) b) c)

(9)



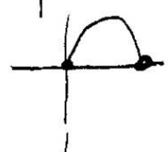
4a)

(8)



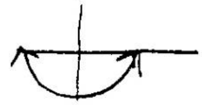
$y = f(x) + 2$
up 2

b)



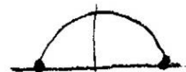
$f(x-2)$
Right 2.

c)



$-f(x)$
Invert graph.

d)



$f(-x)$
(Symm to y axis)
(Same graph here

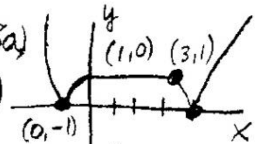
5a) $x = -3, 1$ or $\{-3, 1\}$

(9) b) $(-3, 1)$

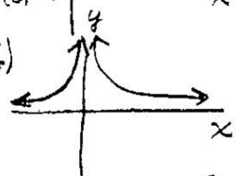
c) $(-\infty, -3] \cup [1, \infty)$

8a)

(6)

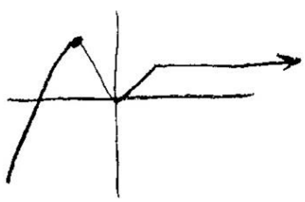


8b)



6.

(6)



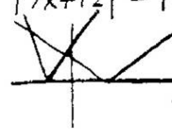
9a) $x = -2, 4$ or $\{-2, 4\}$

(8) b) $(-2, 4)$

c) $(-\infty, -2) \cup (4, \infty)$

10. $|7x+12| = |x-4|$ (use ISECT!)

(8)

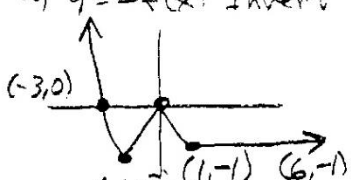


a) $x = -1, -2\frac{2}{3}$ or $-\frac{8}{3}$

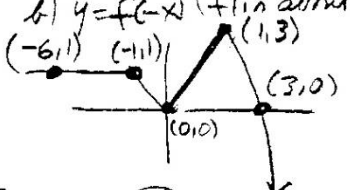
b) $(-\frac{8}{3}, -1)$

c) $(-\infty, -\frac{8}{3}) \cup (-1, \infty)$

a) $y = -f(x)$ Invert.

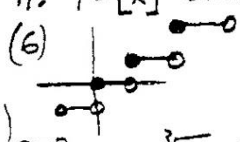


b) $y = f(-x)$ (flip about y)



11. $y = [x]$ Bracket Function

(6)



12. $f(x) = \begin{cases} \sqrt[3]{x} & x < 0 \\ \sqrt{x} + 4 & x \geq 0 \end{cases}$

(10)

$f(-8) = \sqrt[3]{-8} = -2$
$f(0) = \sqrt{0} + 4 = 4$
$f(4) = \sqrt{4} + 4 = 6$

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

(8)

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

b) $f(x+h) - f(x) = -3x^2 - 6xh - 3h^2 + 5x + 5h - (-3x^2 + 5x)$
$= \cancel{-3x^2} - 6xh - 3h^2 \cancel{+5x} + 5h + \cancel{3x^2} - \cancel{5x}$
$= -6xh - 3h^2 + 5h$

c) $\frac{f(x+h) - f(x)}{h}$
$= \frac{-6xh - 3h^2 + 5h}{h}$
$= \frac{\cancel{h}(-6x - 3h + 5)}{\cancel{h}}$
$= -6x - 3h + 5$

7a) $f(0) = 0$

b) $f(4) = 1$

c) $f(-1) = 3$

d) $6f(-1) = 6 \cdot 3 = 18$

13a) $(f \circ g)(x) = f[g(x)]$

(12) $= 4(-2x+4)^2 - 3(-2x+4)$
$= (-2x+4)[4(-2x+4) - 3]$
$= (-2x+4)(-8x+16-3)$
or $16x^2 - 58x + 52 = -2(x-2)(-8x+13)$
$2(x-2)(8x-13)$

b) $(g \circ f)(x) = g[f(x)]$
$= -2(4x^2 - 3x) + 4$
$= -8x^2 + 6x + 4$

c) $(f \circ g)(2) = 0$

d) $(g \circ f)(2) = -8 \cdot 4 + 6 \cdot 2 + 4$
$= -32 + 12 + 4 = -16$