MATH 140. TEST 1 (V1) (FALL 2005. HARVEY).

Name (5 points): key

No notes or texts allowed. You may use a TI-83, TI-84, TI-86 or equivalent calculator. Show all work.

1. (6 points) Find the equation of the line through the points $(1, 2)$ and $(7, 3)$. Write your answer in slope-intercept form.

$$m = \frac{3-2}{7-1} = \frac{1}{6}$$

$$y - 2 = \frac{1}{6}(x-1)$$

$$y - 2 = \frac{1}{6}x - \frac{1}{6}$$

$$y = \frac{1}{6}x + \frac{11}{6}$$

2. (6 points) Find the equation of the line which is parallel to $2x + 3y = 1$ and passes through the point $(1, 1)$. Write your answer in slope-intercept form.

$$2x + 3y = 1 \Rightarrow 3y = 1 - 2x \Rightarrow y = \frac{1}{3} - \frac{2}{3}x$$

$$m = -\frac{2}{3}$$

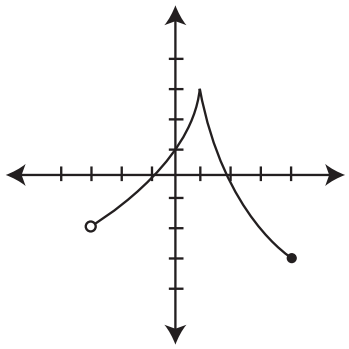
eq. of line:

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

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

$$y = -\frac{2}{3}x + \frac{5}{3}$$

3. (6 points) The graph of the function $f(x)$ is shown below. (a) What is the domain of $f(x)$? (b) What is the range of $f(x)$?



(a) $(-3, 4]$

(b) $[-3, 3]$

4. (6 points) What is the domain of the function $f(x) = \sqrt{5x+4}$?

$5x + 4 \geq 0$

$5x \geq -4$

$x \geq -4/5$ $\quad$ D: $[-4/5, \infty)$

5. (6 points) What is the domain of the function

$$f(x) = \frac{2x - 45}{x^2 - 3x - 10}$$

$x^2 - 3x - 10 = 0$

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

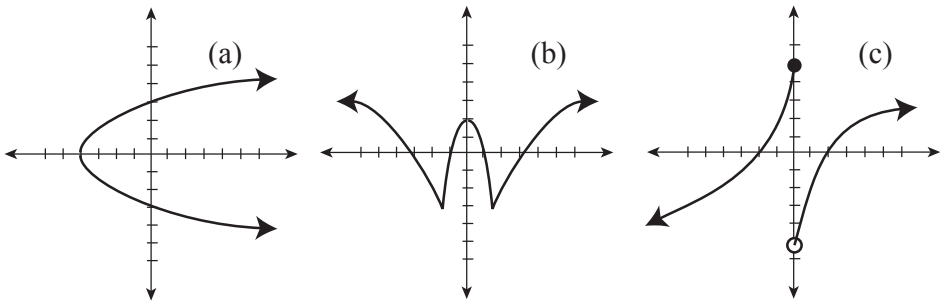
$x - 5 = 0$ $\quad$ $x + 2 = 0$

$x = 5$ $\quad$ $x = -2$

D: all reals except $-2, 5$

$(-\infty, -2) \cup (-2, 5) \cup (5, \infty)$

6. (6 points) Which (if any) of the following graphs is/are the graphs of functions?



(b) and (c) are functions

7. (6 points) (a) Which (if any) of the following functions are one-to-one? (b) Which are even? Which are odd? Which are neither even nor odd?

	$f(x) = \sqrt{x}$	$g(x) = \dfrac{5x}{x^2+1}$	$h(x) = x^2 - 5$
(a) one-to-one:	yes	no	no
(b) symmetry:	neither	odd	even

8. (6 points)

$$f(x) = x^2 - x \qquad g(x) = 2x + 3$$

Find $f \circ g(x)$ and $g \circ f(x)$.

$f \circ g(x) = f(2x+3)$

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

$= (2x+3)(2x+3) - (2x+3)$

$= 4x^2 + 12x + 9 - 2x - 3$

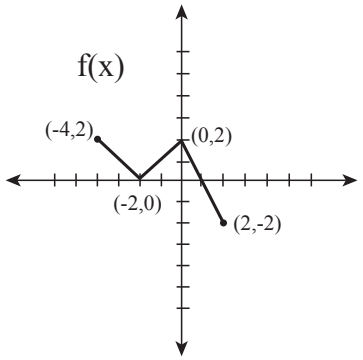
$= 4x^2 + 10x + 6$

$g \circ f(x) = g(x^2 - x)$

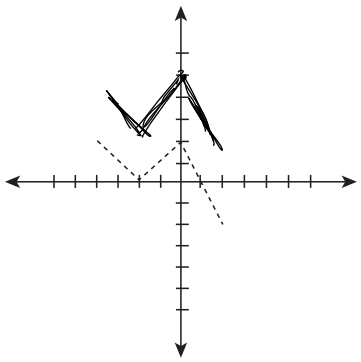
$= 2(x^2 - x) + 3$

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

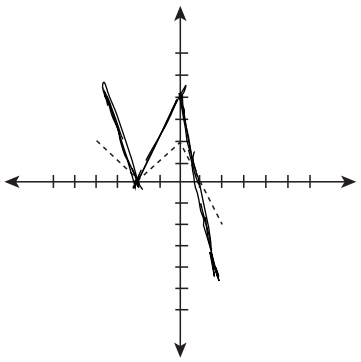
9-12. The graph of $f(x)$ is shown below. Use this to graph the following transformations.



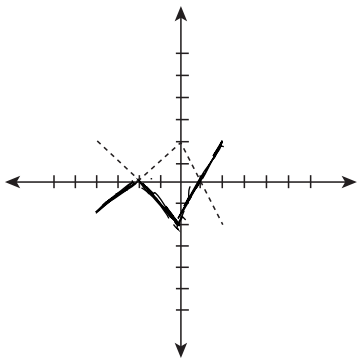
9. (5 points) $f(x) + 3$



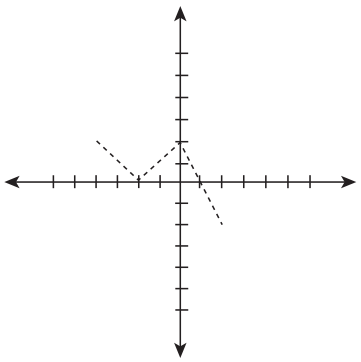
10. (5 points) $f(2x)$



11. (5 points) $-f(x)$



12. (5 points) $\frac{1}{2} \cdot f(x)$



13. (8 points) Graph the piecewise function:

$$f(x) = \begin{cases} 1 - x^2 & x \leq 0 \\ 3x + 1 & x > 0 \end{cases}$$

14. (8 points) Graph the piecewise function:

$$f(x) = \begin{cases} x & x < -2 \\ x^2 - 4 & -2 \leq x \leq 2 \\ 2 + x & x > 2 \end{cases}$$

15. (6 points)

$$f(x) = x^3 + 11$$

Find the inverse function $f^{-1}(x)$.

16. (8 points)

$$f(x) = \frac{2x + 5}{3x - 1}$$

Find the inverse function $f^{-1}(x)$. What is the range of $f(x)$?