

MATH 140. TEST 1 (v2) (FALL 2005. HARVEY).

Name (5 points): _____

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 (3, 0) and (5, 6). Write your answer in slope-intercept form.

$$m = \frac{6-0}{5-3} = 3$$

$$y - 0 = 3(x - 3)$$

$$y = 3x - 9$$

2. (6 points) Find the equation of the line which is parallel to $3x - 4y = 3$ and passes through the point (2, 1). Write your answer in slope-intercept form.

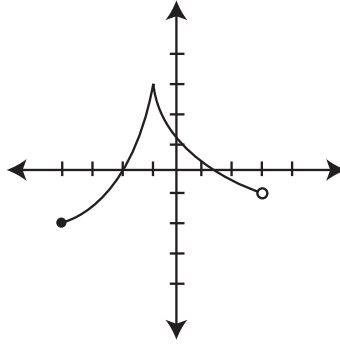
$$3x - 4y = 3 \Rightarrow -4y = 3 - 3x \Rightarrow y = -\frac{3}{4} + \frac{3}{4}x$$

$$\Rightarrow m = \frac{3}{4}$$

$$y - 1 = \frac{3}{4}(x - 2)$$

$$y - 1 = \frac{3}{4}x - \frac{3}{2} \Rightarrow y = \frac{3}{4}x - \frac{1}{2}$$

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) domain: $[-4, 3)$ b) range: $[-2, 3]$

4. (6 points) What is the domain of the function $f(x) = \sqrt{6x + 1}$?

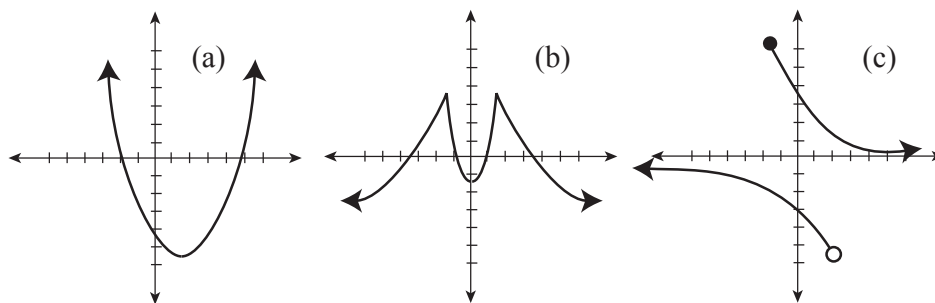
$$\begin{aligned} 6x + 1 &\geq 0 \\ 6x &\geq -1 \\ x &\geq -\frac{1}{6} \end{aligned} \quad \mathcal{D}: \left[-\frac{1}{6}, \infty\right)$$

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

$$f(x) = \frac{4x - 12}{x^2 + 6x - 7}$$

$$\begin{aligned} x^2 + 6x - 7 &= 0 \\ (x + 7)(x - 1) &= 0 \\ x + 7 = 0 & \quad x - 1 = 0 \\ x = -7 & \quad x = 1 \end{aligned} \quad \begin{aligned} \mathcal{D}: & \text{all reals except } -7, 1 \\ & (-\infty, -7) \cup (-7, 1) \cup (1, \infty) \end{aligned}$$

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



(a) and (b) 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?

	$f(x) = \sqrt[3]{x}$	$g(x) = x^2 - 3x$	$h(x) = \frac{5}{x^2 + 1}$
one-to-one :	yes	no	no
symmetry :	odd	neither	even

8. (6 points)

$$f(x) = x^2 + 2x$$

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

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

$$f \circ g(x) = f(x+4)$$

$$= (x+4)^2 + 2(x+4)$$

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

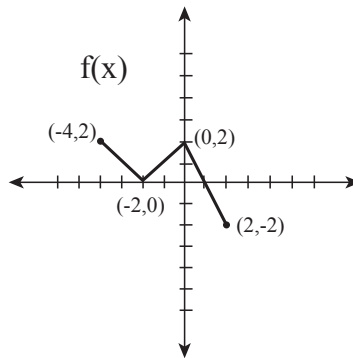
$$= x^2 + 8x + 16 + 2x + 8$$

$$= x^2 + 10x + 24$$

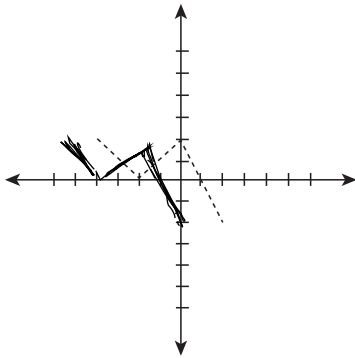
$$g \circ f(x) = g(x^2 + 2x)$$

$$= x^2 + 2x + 4$$

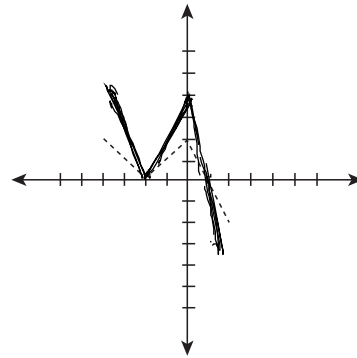
9-12. The graph of $f(x)$ is shown below. Use this to graph the following transformations.



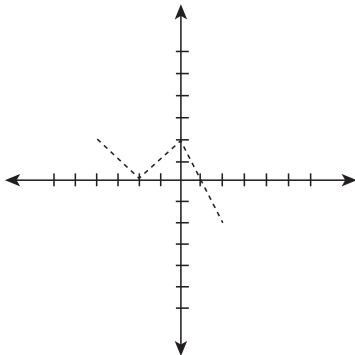
9. (5 points) $f(x + 2)$



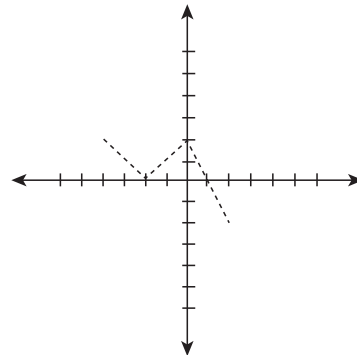
10. (5 points) $2 \cdot f(x)$



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



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



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:

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

15. (6 points)

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

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

16. (8 points)

$$f(x) = \frac{3x + 4}{2x - 3}$$

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