

MAC 1105, Fall 2017.

Exam #2

October 24, 2017

Name Key

- You will be told when to begin the work and when to terminate work on the examination. You must stop when instructed. Points may be deducted in case of violations.
- Please show your work to support your answers that require calculations. Correct but unsupported answers may not be given full credit.
- The use of a cell phone or other electronic communication devices during the examination is not allowed. The exam will be canceled and a grade of "0" will be assigned to anyone who uses a cell phone during the examination or if one is found within hands reach.
- Calculators are not allowed on this exam.
- The exam consists of two parts. Part I contains four multiple choice questions worth 5 points each if not stated otherwise. Part II contains 7 open ended questions worth 10 points each if not stated otherwise.

Honor Code: *On my honor, I have neither received nor given any aid during this examination.*

Signature: _____

Part I

Choose your answer from five available choices. No partial credit will be given for wrong answers.

1. The function $f(x)$ is even if
- (a) $f(x)$ is a polynomial.
 - (b) $f(-x) = -f(x)$
 - (c) $f(-x) = f(x)$
 - (d) $f(x)$ contains only even numbers
 - (e) None of the above

2. Find the domain of

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

- (a) $(-\infty, -3) \cup (-3, \infty)$
- (b) $(-\infty, -3) \cup (-3, 2) \cup (2, \infty)$
- (c) $(-\infty, -3) \cap (-3, \infty)$
- (d) $(-\infty, -3) \cup (-3, 2] \cup [2, \infty)$
- (e) None of the above

3. Find $f(3)$ of the following piecewise function

$$f(x) = \begin{cases} 4, & \text{if } x < 0 \\ -x, & \text{if } 0 \leq x < 3 \\ x^2 - x + 3, & \text{if } x \geq 3 \end{cases}$$

- (a) $f(3) = 9$
- (b) $f(3) = 4$
- (c) $f(3) = -3$
- (d) $f(3) = 6$
- (e) None of the above.

4. (10 points) Match each function with a graph. [Hint: One graph can be used multiple times.]

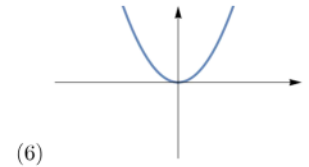
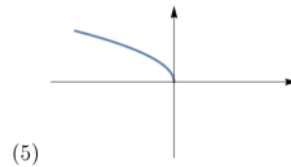
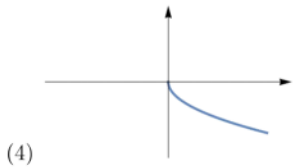
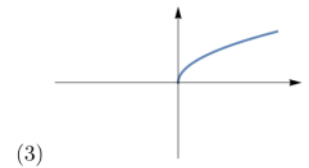
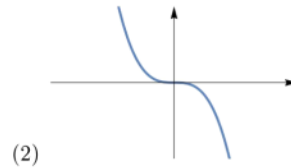
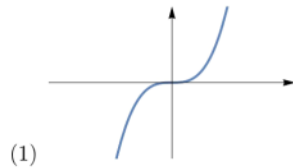
(a) $f(x) = -\sqrt{x}$

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

(c) $f(x) = \sqrt{-x}$

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

A-4 C-5
B-2 D-2



Part II

5. Find the domain of the function.

(a) $f(x) = \frac{x-2}{x-1} - \frac{2}{x+4}$

$x-1 \neq 0$

$x+4 \neq 0$

$x \neq 1$

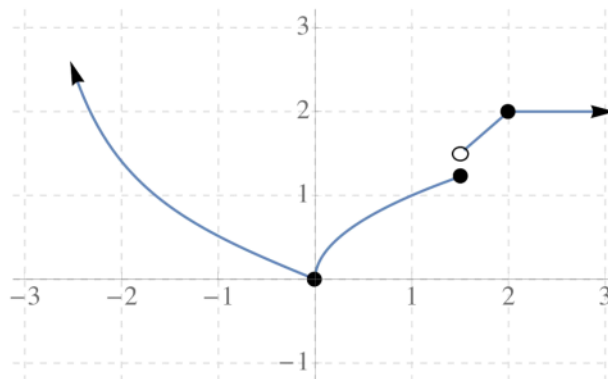
$x \neq -4$

$$(-\infty, -4) \cup (-4, 1) \cup (1, \infty)$$

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

The domain of a polynomial is $(-\infty, \infty)$

6. (15 points) Consider the following function.



(a) Find the domain and range of the graph of the function.

$$\text{Domain: } (-\infty, \infty)$$

$$\text{Range: } [0, \infty)$$

(b) Is f odd, even, or neither?

neither

(c) Determine the intervals on which f is decreasing.

$$(-\infty, 0)$$

(d) Determine the intervals on which f is increasing.

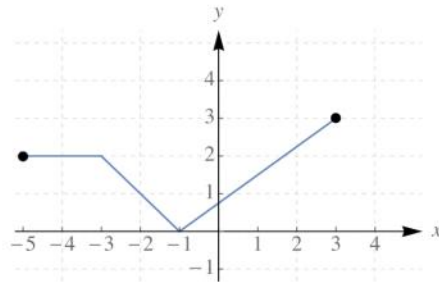
$$(0, 2)$$

(e) Find relative maxima or minima.

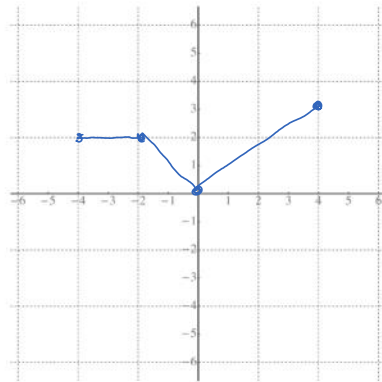
$x=0$ or $(0,0)$ is a rel. minimum

there is no rel. maximum

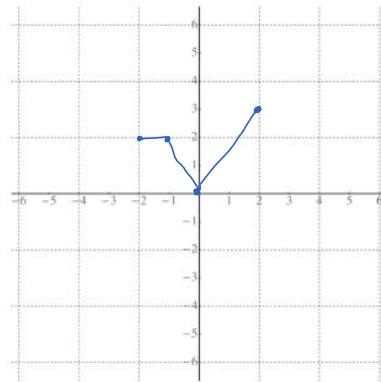
7. (15 points) The graph of a function $y = f(x)$ is given below. Use transformations to graph $y = -f(2x - 1) + 3$. List the transformations needed (use proper names!) and graph each intermediate graph on the grid provided. Be accurate!



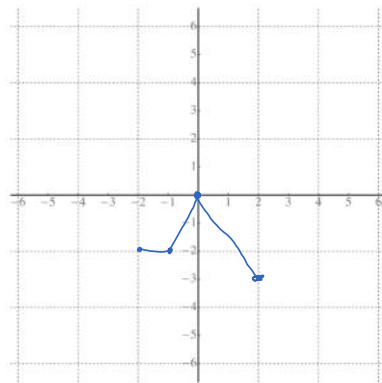
(i) transformation: *hor. shift right by 1*
 $y = f(x-1)$



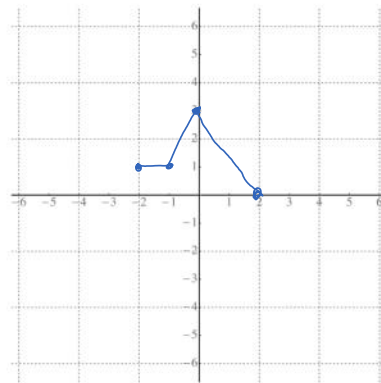
(ii) transformation: *hor. shrink by factor of 2*
 $y = f(2x-1)$



(iii) transformation: *reflection about the x-axis*
 $y = -f(2x-1)$



(iv) transformation: *vertical shift up 3*
 $y = -f(2x-1) + 3$



8. A point $(4, -1)$ is on the graph of a function $y = f(x)$. What point will be on the graph of $y = 2f(-x+1) + 1$?

$$f(x) \rightarrow f(x+1) \rightarrow f(-x+1) \rightarrow 2f(-x+1) \rightarrow 2f(-x+1)+1$$

$$(4, -1) \rightarrow (3, -1) \rightarrow (-3, -1) \rightarrow (-3, -2) \rightarrow \boxed{(-3, -1)}$$

9. Let $f(x) = x^2 - 2x$ and $g(x) = 3x$. Find and simplify the following.

(a) $(f+g)(x)$

$$x^2 - 2x + 3x = \boxed{x^2 + x}$$

(b) $\left(\frac{f}{g}\right)(x)$

$$\frac{x^2 - 2x}{3x} = \frac{x(x-2)}{3x} = \boxed{\frac{x-2}{3}}$$

10. Determine if the following function is odd, even, or neither.

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

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

$\boxed{\text{odd}}$

11. (15 points) Graph the function $f(x) = \begin{cases} x - 2 & , \text{ if } x < 2 \\ 1 & , \text{ if } 2 \leq x \leq 3 \\ (x - 2)^2 & , \text{ if } x > 3 \end{cases}$

