

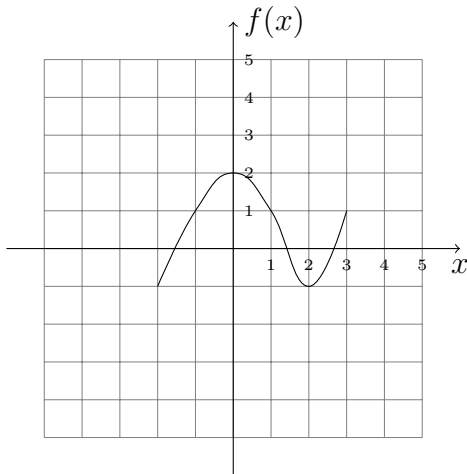
UC Berkeley  
Department of Mathematics  
Math 32– Midterm 1 Jeff Hicks

Name:

UID:

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- Please do not turn over this page until instructed to do so.
  - This exam contains 7 problems, of which we will score 6 problems. Indicate to us which 6 problems you would like us to grade by checking the small box at the top of the page. We will only grade 6 problems. Each problem is worth 10 points, for a total score of 60 points on this exam.
  - There are no notes or calculators allowed during the examination.
  - Should you finish during the last 15 minutes of the exam period, please remain seated *until we have collected all of the exams* as other students will still be working.
  - Solutions without work shown may not receive full credit. Box the solution you would like us to grade on each problem.
  - This exam contains 8 pages (including this page.)

1. Let  $f(x)$  be the function whose graph is drawn below.



(a) (1 point) What is  $f(2)$ ?

$$f(2) = -1$$

(b) (2 points) Explain whether or not the function  $f(x)$  is one-to-one.

$$\text{No, as } f(1) = f(-1) = 1.$$

(a) (2 points) Describe the domain and range of  $f$  in interval form.

$$\text{Range: } [-1, 2]$$

$$\text{Domain: } [-2, 3]$$

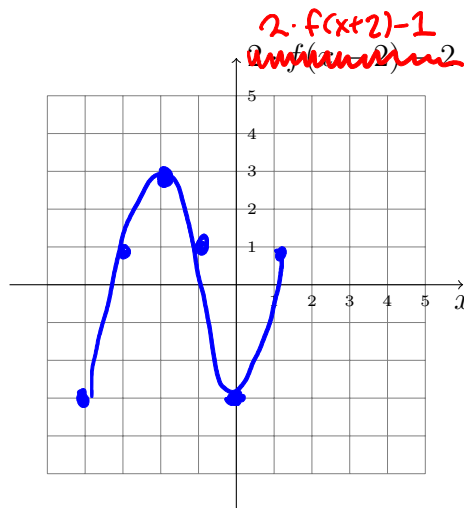
(c) (5 points) Draw the graph of the function  $2 \cdot f(x+2) - 1$  in the space below.

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

$\rightarrow$  shifted 2 left

$\rightarrow$  scaled vert 2

$\rightarrow$  shifted down 1



2. Consider the functions given by the tables below.

x	f(x)
1	4
2	2
3	1
4	5
5	3

x	g(x)
1	4
2	4
3	2
4	2
5	3

(a) (1 point) What is  $f(3)$ ?

$$f(3) = 1$$

(b) (2 points) Compute  $(f \cdot g)(5)$ .

$$f(5) = 3 \quad (f \cdot g)(5) = 9$$

$$g(5) = 3$$

(c) (3 points) Compute  $(g \circ f)(3)$ .

$$g(f(3)) = g(1) = 4$$

(d) (4 points) Compute  $(f^{-1} \circ g)(2)$ .

$$f^{-1}(g(2)) = f^{-1}(4) = 1.$$

3. (a) (5 points) Give the equation of a line containing the points  $(4, -2)$  and  $(2, -1)$ .

$$m = \frac{-2 - (-1)}{4 - 2} = -\frac{1}{2}$$
$$(y - 4) = -\frac{1}{2}(x - 4)$$
$$\boxed{y = -\frac{1}{2}x + 2}$$

- (b) (3 points) Find the equation of a line which passes through the origin and is perpendicular to the line from Part (a).

$$\text{slope} = \frac{1}{-m} =$$

- (c) (2 points) Find the point of intersection between the lines from Parts (a) and (b).

4. (10 points) Describe the set of real numbers satisfying the inequality  $|3x - 3| < x$  using interval notation.

5. Consider the function

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

(a) (2 points) Write the domain of  $f(x)$  using interval notation.

(b) (5 points) Write an equation for the function  $f^{-1}(x)$ .

(c) (3 points) Write down the domain and range of  $f^{-1}(x)$  using interval notation.

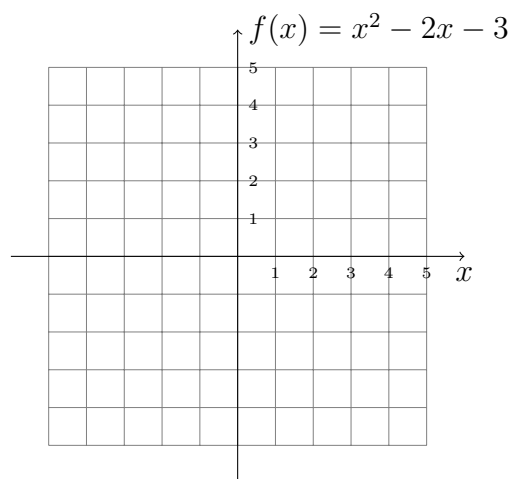
6. Consider the parabola given by the graph of the function

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

(a) (2 points) Algebraically find the zeros of  $f(x)$ .

(b) (4 points) Algebraically find the vertex of  $f(x)$ .

(c) (4 points) Graph  $f(x)$  below, and mark the zeros and vertex of the parabola.



7. (10 points) Find all points where the line  $y = \frac{3}{4}x$  intersects the circle of radius 5 centered at the origin.