

Math113 College Algebra

First Midterm Exam

Colorado Mesa University 2024 Fall

NAME: _____

1. If f is a function that halves its input and then add seven, what is the value of $f(3)$?

2. This table reports input/output pairs for a function g . What is the value of $g(4)$?

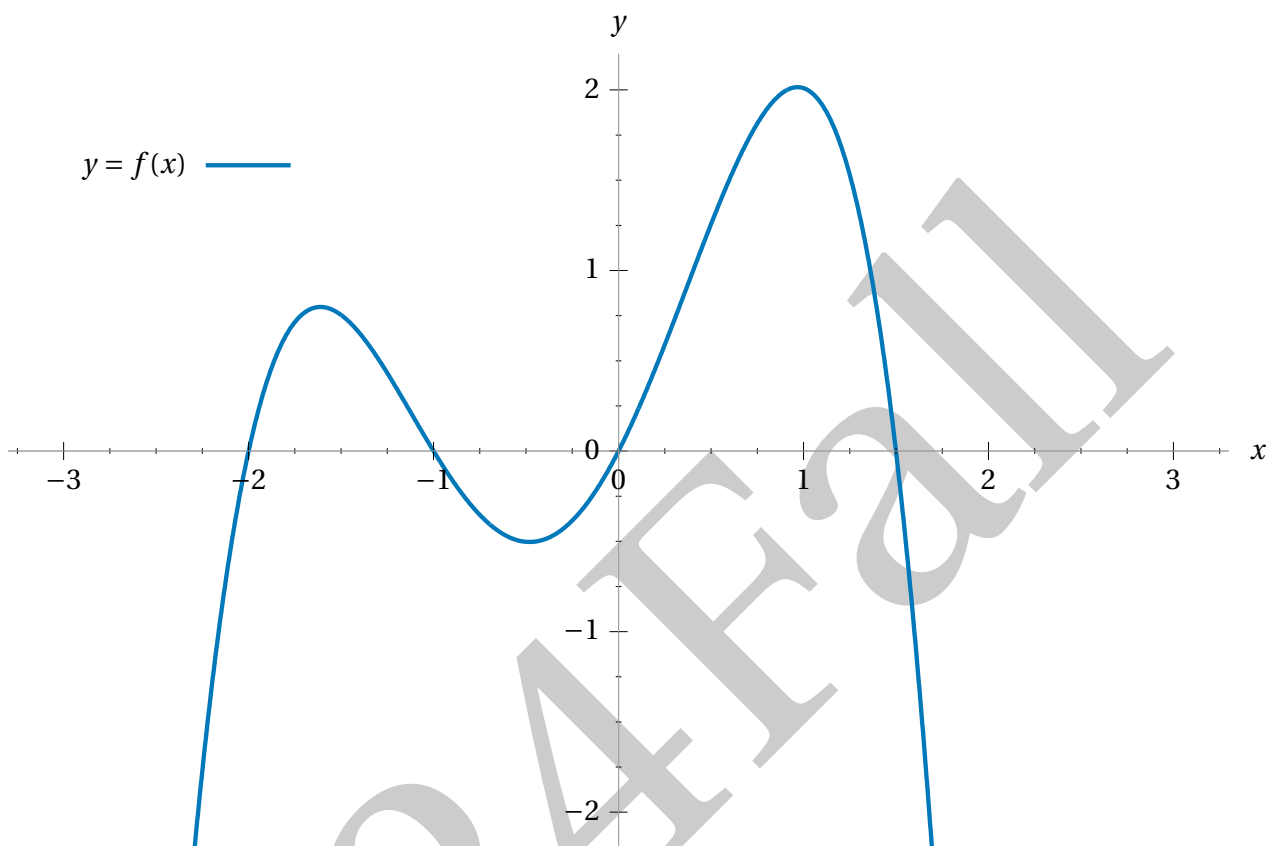
x	-1	0	2	3	4	5
$g(x)$	4	22	0	9	32	-1

3. What's the slope of the line $2y - 3x = 4$?

4. What's the x -intercept of the line $2y - 3x = 4$?

5. Does the point $(7, 3)$ lie on the graph of the function $h(x) = \frac{1}{15}x^2 - \frac{1}{5}$? In one sentence, state how you figured out the answer this question.

6. Consider this graph of the functions f .



- (a) Estimating, what is $f(0.5)$?
- (b) Estimating, for what value(s) of x does $f(x) = -1$?
- (c) Estimating, what appears to be the range of f ?
- (d) Estimating, on what interval(s) is f increasing?
- (e) On this same set of axes above, accurately plot the graph of the function $g(x) = 1 - \frac{1}{2}x$.
- (f) On this same set of axes above, accurately plot the line that is parallel to the graph of g but has an x -intercept of -2 .
- (g) What is an equation of the line that is perpendicular to the graph of g but has a y -intercept of 17 ?

7. Recall the formula for the future value A of an initial investment of P dollars at a *simple* annual interest rate r invested for t years is given by the formula $A = P(1 + r t)$.

(a) Solve this equation for r in terms of the other variables.

(b) If you have \$6900 available to invest, and you'd like it to appreciate to be worth \$9798 in ten years, at what interest rate must you invest it?

8. What is an equation of the line that passes through the points $(-3, 7)$ and $(7, 1)$? In one sentence, state how you can tell from the equation if this line is *increasing* or *decreasing* as x increases.

9. *Demonstrate* algebraically how to find the coordinates of the point where the lines corresponding to these two equations intersect.

$$9x - 2y = -5$$

$$3y - 3x = 11$$

10. Here is data recorded on Wikipedia¹ for the population of Grand Junction for select decades.

Year	2020	2010	2000	1990	1980	1970
Population (in thousands)	65.6	58.6	42.0	29.0	28.0	20.2

- (a) Using technology, perform *linear regression* to find a model f for the population of Grand Junction x years *since 1950*. (e.g. for the year 2008, $x = 58$.) Write the formula for your model here.
- (b) According to your model, at what *rate*, measured in *people-per-year*, is Grand Junction's population growing?
- (c) (EXTRAPOLATE) Assuming this model remains accurate beyond the domain of the data, what does it predict the current population of Grand Junction to be?
- (d) (EXTRAPOLATE) Assuming this model remains accurate beyond the domain of the data, how many years before the population of Grand Junction crosses the 100,000 person threshold?
- (e) Do you think a linear function is a reasonable choice of model to accurately describe this situation in the long run? (Write down your thoughts, list pros and cons, etc.)

¹From en.wikipedia.org/wiki/Grand_Junction,_Colorado#Demographics.