

NAME:

1. [3] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F. Let f be a function, and x , y , and z be non-zero real numbers.

T F $\frac{2}{x} + \frac{1}{x^2} = \frac{5}{x^2}$

T F $x^{-1} + y^{-1} = \frac{1}{x+y}$

T F $(x+y)^2 = x^2 + 2xy + y^2$

T F The line $y = \frac{2}{3}x - \pi$ is perpendicular to the line $2y - 5 = -3x + 2$.

T F The graph of $-x^{15} + 6x^4 - 54x - 2.17$ is an even function.

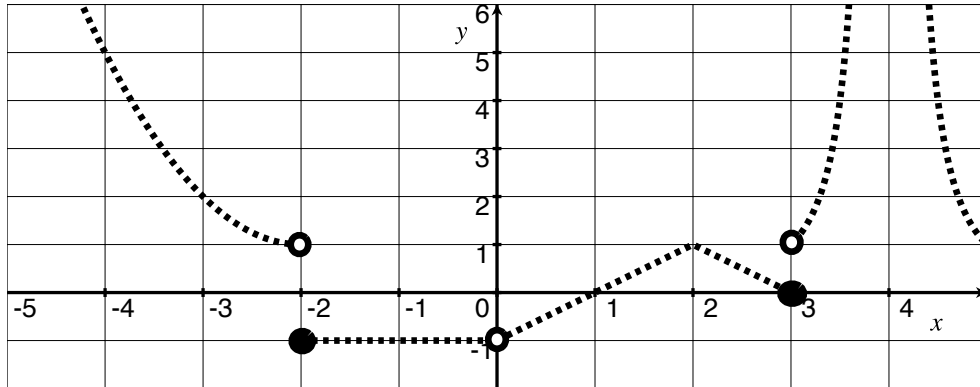
T F All functions are either even or odd.

Show your work for the following problems. The correct answer with no supporting work will receive NO credit.

2. [4] Solve for r , writing it as a reduced fraction:

$$\frac{1}{\frac{1}{r} + \frac{1}{s}} = t$$

3. Let the following be the graph be a piece-wise defined graph of g .



(a) [2] (§1.2) Is g a function? Why or why not?

(b) [1] (§1.2 #21) Estimate the value of $g(-3 + 2)$.

(c) [2] (§1.2) Estimate the value of $g(-3) + g(2)$.

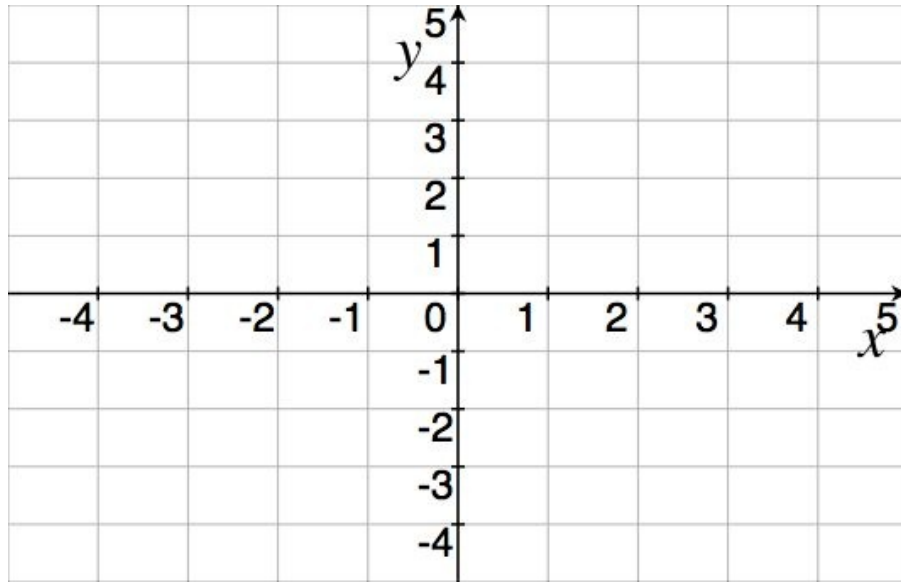
(d) [2] (§1.4) Estimate the value of $g \circ g(2)$.

(e) [3] (§1.2 #19) What is the domain of g ?

4. [3] (§2.1 #13) Find the number c so that $(c, 13)$ is on the line containing $(-4, -17)$ and $(6, 30)$.

5. Let f be the *function* defined by

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



(a) [3] (§1.3) Graph f . (Explaining graph transformations is worth partial credit.)

(b) [2] (§1.2 #43) Find all possible input(s) so that $f(x) = 1$.

6. (Practice Exam) Let $g(x) = x^2 + 5x - 6$.

(a) [2] Find the roots of g .

(b) [3] Put g into vertex form.

7. Let $\alpha(x) = \frac{x-1}{-2x+7}$.

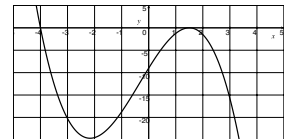
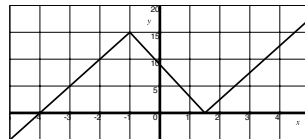
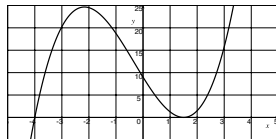
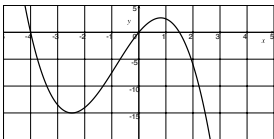
(a) [1] What is the domain of α ?

(b) [2] Given that α has an inverse, find α^{-1} .

(c) [2] What is the range of α ? Justify yourself.

8. (Lecture 4/15) Let $m(x) = x^3 + x^2 - \frac{39}{4}x + 9$ and $n(x) = x + 4$.

(a) [2] Which of the following could be a graph of m ?



(b) [4] Use long division to find $G(x)$ and $R(x)$ so that $\frac{m(x)}{n(x)} = G(x) + \frac{R(x)}{n(x)}$

9. [4] (WebHW6 #8) Simplify the following as much as possible (remember to show your work):

$$(3a^2b^3c^5)^2\left(\frac{1}{3}b^{-1}a\right)^3$$

10. [5] (Story Problem Worksheet) Choose *ONE* of the following. Clearly identify which of the two you are answering and what work you want to be considered for credit.
- (a) A salesperson finds that his sales average \$400 per store when he visits 25 stores a week. Each time he visits an additional store per week, the average sales per store decrease by \$30. How many stores should he visit if he wants to maximize his sales?
- (b) Potassium ferrate has been considered for use in batteries but costs \$100 per gram. You have a battery case that is currently *full* with 50 grams of a mixture that is 10% potassium ferrate. You would like to build the battery but you need a higher concentration of the potassium ferrate (40% should do it). What is the minimum amount of potassium ferrate you will have to buy and add to the battery case (after you dumped out some of the original mixture to make room) to get the cathode to work?