

NAME: This is a sample exam to be used for practice. This is *not* a template for the exam that will be given in class. Many of the questions on the exam will look quite different than those appearing here.

1. [4] 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 real numbers with $z \neq 0$.

T F $\frac{3x+y}{3z} = \frac{x+y}{z}$

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

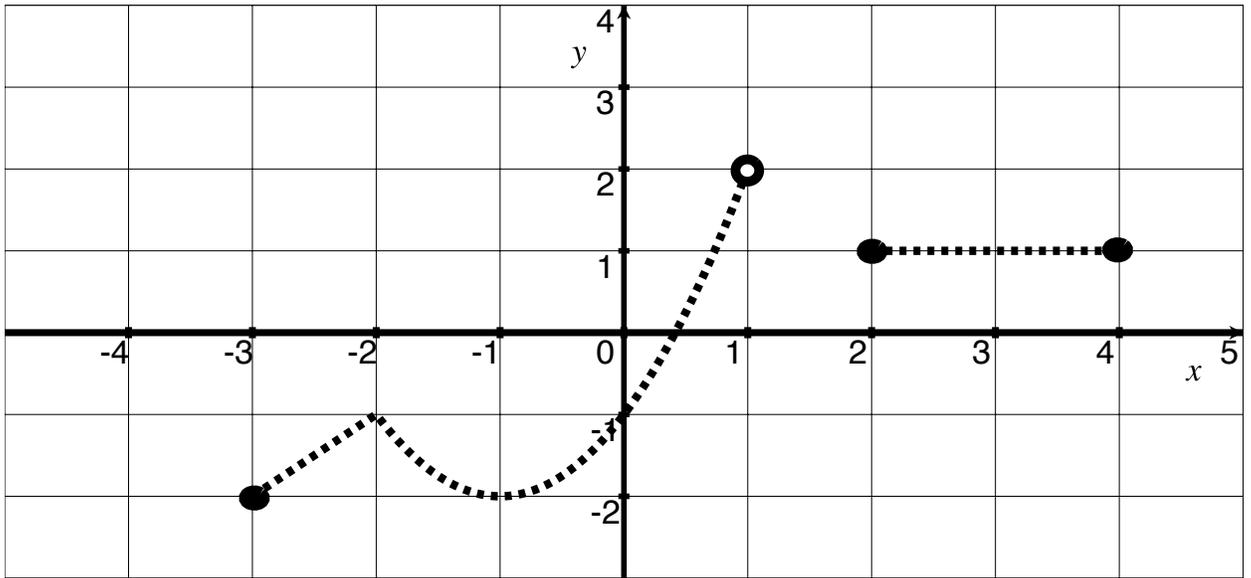
T F $|x| = x$

T F $\frac{3+5i}{1-2i} = -\frac{7}{5} + \frac{11}{5}i$

Show your work for the following problems. The correct answer with no supporting work will receive NO credit (this includes multiple choice questions).

2. [3] Given $3(7+x)^{-2} - 4 = 2$, solve for x .

3. [4] Let f be the function whose graph is below:



Estimate the following *if* possible:

$$f(-3) \qquad \frac{f(-3) - 1}{f(-1)}$$

$$f(1) \qquad (f \circ f)(-2)$$

$$f(-1)f(2) \qquad f(0 + .5)$$

$$\frac{f(0 + .5)}{.5}$$

The average rate of change of f
from $x = 0$ to $x = .5$

4. [4] Find the domain of g where $g(x) = \frac{2-\sqrt{5-2x}}{x+10}$.

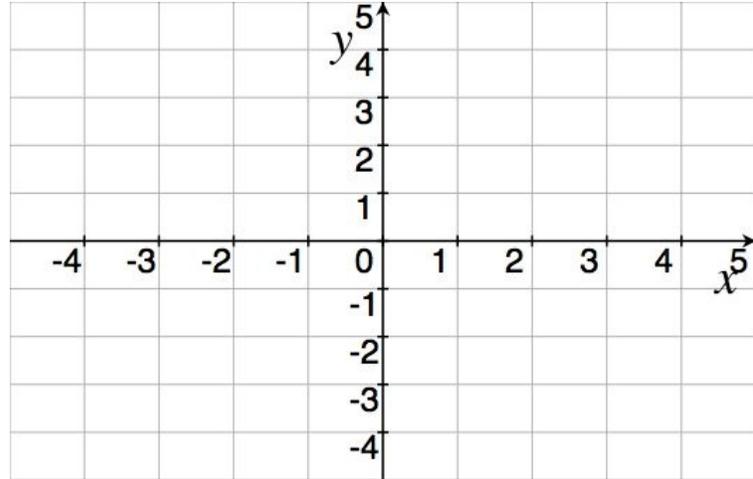
5. [4] Consider the points $P = (3, 4)$ and $Q = (-1, -2)$. Find the equation to a line that goes through the point $(1, 1)$ and has a perpendicular slope to the line connecting P and Q .

- [1] What is the y intercept of the line you found?

- [1] Find the zeros of the line you found above.

6. Let h be the *function* defined by:

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



(a) [3] Graph h . (Explaining graph transformations is worth partial credit.)

(b) [] What are the coordinates of the vertex on the piece of the graph above that is a parabola?

(c) [2] Find all possible input(s) so that $h(x) = 1$.

(d) What is the range h ?

7. [4] Given that $j(x) = -3x^2 + 6x - 2$. Write j in vertex (standard) form.

8. [4] Simplify the following as much as possible:

$$\frac{(2x^4y^{\frac{1}{6}})^3(6xy^3)^{-3}}{8^{\frac{-2}{3}}x^4y^4}$$

9. [3] Find a cubic polynomial whose graph passes through the points $(-2, 0)$ and $(1, 0)$ and has a root at 6. Note: there are many correct answers possible here.

10. Let $m(x) = x^3 + x^2 - \frac{39}{4}x + 9$ and $n(x) = x + 4$. Use long division to find $D(x)$ and $R(x)$ so that $\frac{m(x)}{n(x)} = D(x) + \frac{R(x)}{n(x)}$

11. Let $p(x) = \frac{x - 5}{7x + 5} + 3$.

(a) Given that p is one-to-one (ie has an inverse), find p^{-1} .

(b) Write the expression $p(a + h)$ and simplify.

(c) Write the expression $\frac{p(a + h) - p(a)}{h}$ and simplify.

12. A rectangular box with a volume of 60 ft^3 has a square base. Find a function that models its surface area S in terms of the length x of one side of its base.