

Name:

Math 111–Final Exam

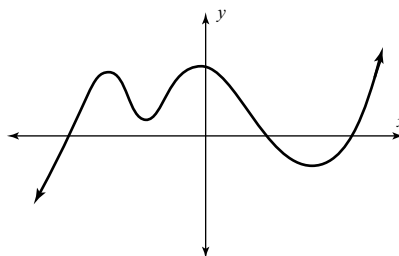
There are 190 points possible. The point value for each problem is labelled next to the problem number.

1. (3pts each) True or False:

(a) The point $(1, 4)$ is on the graph of the function f where $f(x) = 3x^3 - 2x + 3$.

(b) The lines $2y = -6x + 10$ and $y + 3x = 0$ are parallel.

(c) The following could be a graph of a polynomial function of degree 3.



(d) The domain of the function g whose rule is $g(x) = \sqrt{2x - 3}$ is $[0, \infty)$.

(e) If $g(x) = -f(x) + 4$, then the graph of g is the graph of f shifted down 4 units and then reflected about the x -axis.

(f) If $x^2 - 9$ is a factor of a polynomial $f(x)$, then $x - 3$ and $x + 3$ are also factors of $f(x)$.

(g) There is no real number x such that $|2x^2 + \sqrt{x} - 19x| = -2$.

(h) For all $x > 0$

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

2. (3pts each) Fill in the blank.

(a) If $f(x) = 3 \log(x - 3)$ then $f(4) =$ _____

(b) If f is an even function and the point $(1, 4)$ is on the graph of f , then $f(-1) =$ _____

(c) If $f(x) = \ln(x)$ and $g(x) = \sqrt{3 - x}$ then the domain of the function $\frac{f}{g}$ is _____

(d) If f is a one-to-one function with domain $(-2, 5) \cup [2, 5]$ and range $[1, 3)$, then the domain of f^{-1} is _____ and the range of f^{-1} is _____

(e) If f is a polynomial function and $f(7) = 0$, then we know _____ is a factor of $f(x)$.

3. (10pts) Give the equation of the line which passes through the points $(0, 4)$ and $(9, -5)$.

4. (10pts) Solve for x

$$x^2 - 16 = 3x(x - 4)$$

5. (10pts) Find the center and radius of the circle which is the graph of the following equation.

$$x^2 + 6y - 2 = 3 - y^2$$

6. (10pts) Recall that the difference quotient for a function f is given by

$$\frac{f(x+h) - f(x)}{h}$$

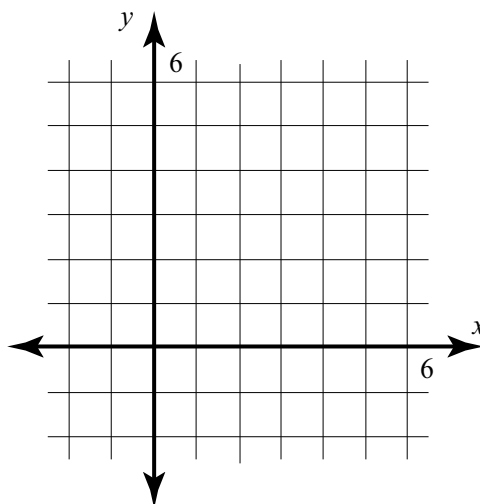
Compute the difference quotient for f where

$$f(x) = 12x^4 + \log(x) - x^2.$$

(You do NOT need to simplify your answer)

7. (10pts) Sketch a graph of the function g where

$$g(x) = \begin{cases} 5, & \text{if } x < 1; \\ (x - 3)^2, & \text{if } x \geq 2. \end{cases}$$



8. (10pts) If you invest \$25 at 31% compounded continuously, how long will it take for you to have \$137 ? (You do not need to simplify your answer, but be sure to include units)

9. (10pts) Use the Round Trip Theorem to show that the functions g and f are inverses where

$$g(x) = 2x + 4 \quad \text{and} \quad f(x) = \frac{x - 4}{2}$$

10. (10pts) Find the inverse of the one-to-one function f where

$$f(x) = 10e^{x-7}.$$

11. (10pts) Recall that the area A of a triangle with base b and height h is given by $A = \frac{1}{2}bh$. What is the maximal area of a triangle in which the sum of the base and twice the height is 4?

13. (10pts) Use long division to find all the roots of $f(x) = x^3 + x^2 - 14x - 24$ given that $f(-3) = 0$.

14. (10pts) For what values of x is $|3x - 11| > 7$? Give your answer in interval notation.

15. (10pts) Is the function f whose rule is given by $f(x) = 2x^2 - 4x$ even, odd, or neither?
(You must justify your answer to receive credit)

16. (10pts) Solve for x

$$\log_2(x - 2) = \log_2(1 - x) + \log_2(3)$$