

MATH 111: FINAL EXAM

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Answer the questions in the spaces provided on the question sheets and turn them in at the end of the class period. Unless otherwise stated, all supporting work is required.

Name: _____

1 (10 Points). *Add the following rational expressions and simplify the result,*

$$\frac{1}{x + \sqrt{3}} + \frac{1}{x - \sqrt{3}}.$$

2 (10 Points). *Consider the two lines $f(x) = 5x + 16$ and $g(x) = 8x + 7$. Find the point (that is, the (x, y) pair) where these two lines intersect.*

3 (10 Points). Let $f(x) = 2x^2 - 8x + 4 = 0$.

(a) Put $f(x)$ into standard form.

(b) Solve $f(x) = 0$.

(c) Use the information from parts (a) and (b) to sketch a graph of $f(x)$. Label the y -intercept, any x -intercept(s), and the vertex.

4 (10 Points). In the following problems, use the given information to find the equation of the line in slope-intercept form.

(a) The line passing through the points $(4, 20)$ and $(1, 14)$.

(b) The line passing through the point $(6, 12)$ and parallel to the line in part (a).

(c) The line passing through $(4, 8)$ and perpendicular to the line in part (a).

5 (10 Points). A \$640 investment is made in an account with an annual interest rate of 50% that compounds semiannually.

(a) Give the formula for the balance of the account as a function of time, t . [Hint: If you compute the growth factor without using decimals, this will make the next computation significantly easier.]

(b) What is the balance of the account after 1 year?

(c) Compute the interest accrued after 1 year.

(d) Give the Annual Percentage Yield for the investment.

6 (10 Points). *A biologist observes a population with initial size 81. In two years, the biologist returns to observe the population again and finds that only 9 remain.*

(a) Find an exponential model for the size of the population as a function of t years.

(b) Does the function from part (a) model growth or decay?

(c) Use the model from part (a) to determine how many years it will take for the size of the population to reach 1.

7 (10 Points). *Compute the following logarithms.*

(a) $\log_{64}(16)$.

(b) $\log_{49}(7)$.

(c) $\log_8(4)$.

(d) $\log_9(81)$.

8 (10 Points). (a) *Simplify the expression*

$$\log_4(x+3) + \log_4(x-3).$$

(b) *Solve the following equation for x*

$$\log_4(x+3) + \log_4(x-3) = 2$$

9 (10 Points). *Solve the following equation for x*

$$e^{x^2} = e^{-2x-1}$$

10 (10 Points). Let $f(x) = \sqrt{x}$ and $g(x) = x^2 - 9$.

(a) Compute the composition of f with g , $(f \circ g)(x)$.

(b) What is the domain of $(f \circ g)(x)$?

(c) Is $(f \circ g)(x)$ invertible? Explain why or why not. If it is, give its inverse.