

**Name:**

**Recitation Instructor:**

**Recitation Day and Time:**

## **Studio College Algebra – Exam 3 – Fall 2016**

**Directions:** You will find 16 problems listed below. Each problem is worth 5 points. No notes/books/friends are allowed. Graphing calculator models above the level of a TI-84 plus are not allowed (in particular, calculators with a built in CAS and/or QWERTY keyboard are not allowed). You have one hour to complete this exam. **SHOW ALL WORK!**

1. Rewrite the formula by taking the logarithm of both sides, and then use properties of logarithms wherever applicable:  $y = \frac{8}{x^2}$  (you may assume  $x > 0$ .)

2. Rewrite the formula by taking the logarithm of both sides, and then use properties of logarithms wherever applicable:  $y = (1.4)^{7^x}$ .

3. If  $\log(a) = 2.4$  and  $\log(b) = 1.2$ , find  $\log\left(\frac{a^3}{\sqrt[7]{b}}\right)$ .

4. Roughly what lump sum would need to be invested at an annual interest rate of 2%, under continuous compounding, for 5 years, in order to end up with \$10000? Round answer to the nearest cent.

5. Solve  $6^{x-7} = 8$ . Leave answer exact, i.e., do not use calculator.

6. Solve  $6 \ln(2x - 7) - 1 = 23$ . Leave answer exact, i.e., do not use calculator.

7. Given  $f(x) = \log_3(x + 1)$ , find  $f^{-1}(x)$ .

8. Find the domain of  $f(x) = 37 \ln(6 - 4x) + 1729$ .

9. The function  $P(t) = 21.109 - 5.686 \ln(t + 1)$  describes the revenue, in thousands of dollars, for the sale of a product  $t$  weeks after an ad campaign for the product ended, where  $0 \leq t \leq 10$ . Find  $P(4)$ , round to the nearest cent, and interpret the meaning of  $P(4)$  in a complete sentence.

10. What are all the real and complex zeros of  $x^3 + 125$ , given that one zero is  $x = -5$ ?

11. What is the horizontal asymptote of the function  $f(x) = e^x + 7$ ? Explain briefly how you arrived at your answer, using proper math vocabulary and grammar.

12. Find 2 different fourth degree polynomials, each having single roots at  $x = 9$ ,  $x = 7$  and a double root at  $x = -4$ . DO NOT multiply your answers out.

Answer 1:

Answer 2:

13. Given the revenue function  $R(x) = 225x - x^3$ , where  $x$  is a number of units, what numbers of units give zero revenue?

14. Given that  $x = -2$  is a zero of the polynomial  $p(x) = x^3 + 6x^2 + 21x + 26$ , find all the other zeros, real or complex, of  $p(x)$ .

15. Answer TRUE or FALSE for the statements that follow. (If you answer TRUE, it means the statement is always true!)

- (a) Degree  $n$  polynomials, where  $n$  is even, are one-to-one functions.
- (b) Degree  $n$  polynomials, where  $n$  is odd, are one-to-one functions.
- (c) Quadratic functions are also called degree 2 polynomials.
- (d) The constant term of a polynomial and its  $y$ -intercept are the same.

(e)  $f(x) = \left(\frac{1}{4}\right)^{-2x}$  is an exponential growth function.

16. We discussed the general form of an exponential function in lecture:  $g(x) = a^x$ , where  $a$  is the base with  $a > 0$  and  $a \neq 1$ . Answer the following questions:

- (a) For what values of  $a$  does  $g(x)$  represent exponential growth?
- (b) For what values of  $a$  does  $g(x)$  represent exponential decay?