Part I: Multiple Choice Questions *(5 points each)*

1. What is the equation of the line which passes through the point $(0, 2)$ and is parallel to the line $4x + 2y = 3$?

(a) $y = -2x + 2$ (b) $y = -2x$ (c) $y = 2x + 2$ (d) $y = 0.5x + 2$ (e) $y = -0.5x + 2$

2. How much should you deposit in a savings account with an interest rate of 7%, compounded annually, in order to have \$300,000 at the end of 20 years?

(a) $\dfrac{300,000}{(1.07)^{20}}$ (b) $300,000 \cdot (1.07)^{20}$ (c) $\dfrac{300,000}{(.07)^{20}}$

(d) $300,000 \cdot (1.7)^{20}$ (e) $300,000 \cdot (.07)^{20}$

3. Evaluate $\lim_{n\to\infty}(1 - \dfrac{1}{2n})^n$.

(a) $e^{-1/2}$ (b) $\ln(1/2)$ (c) $e^{1/2}$ (d) e^2 (e) e^{-2}

4. Find the slope of the line between the points $(-2, 2)$ and $(3, -2)$.

(a) $-\frac{4}{5}$ (b) $-\frac{5}{4}$ (c) 4 (d) $\frac{4}{5}$ (e) $\frac{5}{4}$

5. A certain radioactive substance decays exponentially with decay equation

$$y = Ab^t$$

for some constant b. An initial amount of 400 grams of this substance decays to approximately 100 grams in 2 years. How much of this initial amount will be left in 4 years?

(a) 25 g (b) 5 g (c) 10 g (d) 50 (e) 20 g

6. If ball is thrown upward from a height of 100 feet with an initial velocity of 64 feet per second, its height is given by the formula

$$h = -16t^2 + 64t + 100,$$

where h is the height in feet and t is the time in seconds. What is the maximum height the ball reaches?

(a) 164 ft. (b) 144 ft. (c) 196 ft. (d) 200 ft. (e) 150 ft.

7. Let $f(x) = \begin{cases} 2x-2 & \text{if } x < -1 \\ 3x-1 & \text{if } -1 \le x \le 0 \\ 4\sqrt{x}-1 & \text{if } 0 < x \le 1 \\ 2x^2 & \text{if } 1 < x \end{cases}$.

Where does $f(x)$ have discontinuities, if any?

(a) At $x = 1$ (b) At $x = 0$ and $x = 1$ (c) At $x = -1$ and $x = 0$

(d) At $x = -1$, $x = 0$ and $x = 1$ (e) No discontinuities

8. Joe deposits \$30,000 in an account with an annual interest rate of 5%, compounded monthly. How much money will he have in this account at the end of 6 years?

(a) $30,000 \cdot \left(1 + \frac{.05}{12}\right)^{72}$ (b) $30,000 \cdot \left(1 + \frac{.05}{12}\right)^{6}$

(c) $30,000 \cdot (1 + .05)^6$ (d) $30,000 \cdot (1 + .05)^{72}$

(e) $30,000 \cdot \left(1 + \frac{.05}{72}\right)^{6}$

9. What is the value of $\log_8 2$?

(a) 1/3 (b) 1/2 (c) 1 (d) 2 (e) 0

10. Suppose you open an account with \$10,000, at an interest rate of 8% compounded continuously. How much will you have in your account at the end of 20 years?

(a) $10,000\, e^{1.6}$ (b) $\left(\frac{10,000}{e^{.08}}\right)^{20}$ (c) $10,000\left(1+\frac{.08}{20}\right)^{20}$

(d) $10,000\,(1+.08)^{20}$ (e) $10,000\, e^{-1.6}$

11. Which of the following expressions is equal to $e^{2\ln(5x)}$?

(a) $25x^2$ (b) $5x$ (c) $5xe^2$ (d) $10x$ (e) $2e^{5x}$

12. Consider the function $f(x) = \dfrac{x^3}{x^2-2x+1}$. Which of the following 5 statements is true for this function ?

(a) $f(x)$ has a vertical asymptote and no horizontal asymptotes.
(b) $f(x)$ has a vertical asymptote and a horizontal asymptote.
(c) $f(x)$ has no vertical asymptotes.
(d) $f(x)$ has two vertical asymptotes.
(e) none of the above statements is true about $f(x)$.

13. Which of the following is the equation of an asymptote for the function

$$f(x) = \frac{6x^4 - x^2 + 1}{2x^4 + 2} \ ?$$

(a) $y = 3$ (b) $x = -1$ (c) $y = 6$ (d) $y = 2$ (e) $x = 1$

14. Using the properties of the logarithms and the approximations

$$\log_2 3 \approx 1.6 \quad \text{and} \quad \log_2 5 \approx 2.3$$

find an approximation of

$$\log_2 \left(\frac{10}{3} \right) .$$

(a) 1.7 (b) 0.7 (c) 3.9 (d) 4.9 (e) 0.9

Part II: Partial Credit Questions

Show all work and put your final answer in the space provided. You will receive no credit if the answer is not in the space provided and no partial credit for a wrong answer if you do not show your work.

15. (10 pts.) A small company assembling computers has fixed costs of \$6,000 per month. Each computer costs \$800 to make and sells for \$1200. How many computers do they have to make and sell per month to break even?

Ans. _____

16. (10 pts.) A colony of bacteria grows exponentially, as given by an equation of the form

$$P = Ab^t \ .$$

A biologist determined that there were 1000 bacteria initially and 27,000 bacteria 3 hours later.

(a) Write a formula giving the number of bacteria at any time t.

Ans. _____

(b) How many bacteria will be in the colony in 4 hours?

Ans. _____

17. (10 pts.) A movie theater sells on average 120 tickets a day, at a price of \$6 per ticket. They estimate that each 50 cents increase in the ticket price will result in losing on average 10 customers per day.

(a) Find the formula for the number of tickets sold per day, q, as a function of the price per ticket, p.

Ans. _____

(b) Find the formula for the daily revenue, R, as a function of the price per ticket, p.

Ans. _____