

Use this as a guide to the types of questions you will have on your final exam.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**Solve the problem.**

- 1) At a local university, the number of students (in hundreds) who skip at least one class per week can be modeled by the function 1) \_\_\_\_\_

$$f(x) = 100\sqrt{16 - x} \quad 1 \leq x \leq 16$$

where  $x$  represents the number of weeks into the semester and  $f(x)$  represents the number of students skipping classes in that week. Evaluate and interpret  $f'(13)$ .

- A)  $f'(13) = -27.14$ ; In the 13<sup>th</sup> week of the semester, the number of students skipping at least one class per week was decreasing at the rate of 2714 students per week.
- B)  $f'(13) = 27.14$ ; In the 13<sup>th</sup> week of the semester, the number of students skipping at least one class per week was increasing at the rate of 2714 students per week.
- C)  $f'(13) = 28.87$ ; In the 13<sup>th</sup> week of the semester, the number of students skipping at least one class per week was increasing at the rate of 2887 students per week.
- D)  $f'(13) = -28.87$ ; In the 13<sup>th</sup> week of the semester, the number of students skipping at least one class per week was decreasing at the rate of 2887 students per week.
- 2) A publishing company has published a new magazine for young adults. The monthly sales  $S$  (in thousands) is given by  $S(t) = \frac{800t}{t+2}$ , where  $t$  is the number of months since the first issue was published. Find  $S(3)$  and  $S'(3)$  and interpret the results. 2) \_\_\_\_\_
- A) At three months, the monthly sales are \$2,400,000 and increasing at 800,000 magazines per month.
- B) At three months, the monthly sales are \$480,000 and decreasing at 64,000 magazines per month.
- C) At three months, the monthly sales are \$480,000 and increasing at 64,000 magazines per month.
- D) At three months, the monthly sales are \$2, 400,000 and increasing at 64,000 magazines per month.

**Solve the problem.**

- 3) Students in a math class took a final exam. They took equivalent forms of the exam in monthly intervals thereafter. The average score  $S(t)$ , in percent, after  $t$  months was found to be given by 3) \_\_\_\_\_

$$S(t) = 74 - 15\ln(t + 1), \quad t \geq 0$$

Find  $S'(t)$ .

- A)  $S'(t) = \frac{15}{t+1}$
- B)  $S'(t) = -15 \ln\left(\frac{1}{t+1}\right)$
- C)  $S'(t) = 74 - \frac{15}{t+1}$
- D)  $S'(t) = -\frac{15}{t+1}$

- 4) Suppose that the amount in grams of a radioactive substance present at time  $t$  (in years) is given by 4) \_\_\_\_\_

$A(t) = 480e^{-0.79t}$ . Find the rate of change of the quantity present at the time when  $t = 7$ .

- A) -1.5 grams per year
- B) 1.5 grams per year
- C) 247.9 grams per year
- D) -247.9 grams per year

5) Assume that the temperature of a person during an illness is given by: 5) \_\_\_\_\_

$$T(t) = \frac{5t}{t^2 + 1} + 98.6,$$

where  $T$  = the temperature, in degrees Fahrenheit, at time  $t$ , in hours. Find the rate of change of the temperature with respect to time.

A)  $\frac{dT}{dt} = \frac{5}{t^2 + 1}$       B)  $\frac{dT}{dt} = \frac{5(1 - t^2)}{(t^2 + 1)^2}$       C)  $\frac{dT}{dt} = \frac{5(t^2 - 1)}{(t^2 + 1)^2}$       D)  $\frac{dT}{dt} = \frac{5(1 - t^2)}{t^2 + 1}$

**Differentiate.**

6)  $y = e^{4x^2} + x$  6) \_\_\_\_\_

A)  $8xe^{2x} + 1$       B)  $8xe^{4x^2} + 1$       C)  $8xe + 1$       D)  $8xe^{x^2} + 1$

**Solve the problem.**

7) Determine the derivative of  $f(x) = \frac{14}{\ln x}$ . 7) \_\_\_\_\_

A)  $f'(x) = \frac{14}{x(\ln x)^2}$       B)  $f'(x) = \frac{14x}{(\ln x)^2}$       C)  $f'(x) = \frac{-14}{x(\ln x)^2}$       D)  $f'(x) = \frac{-14x}{(\ln x)^2}$

8) Murrel's formula for calculating the total amount of rest, in minutes, required after performing a particular type of work activity for 30 minutes is given by the formula  $R(w) = \frac{30(w - 4)}{w - 1.5}$ , where  $w$  is the work expended in kilocalories per min. A bicyclist expends 5 kcal/min as she cycles home from work. Find  $R'(w)$  for the cyclist; that is, find  $R'(5)$ . Round to the nearest hundredth. 8) \_\_\_\_\_

A) 6.12 min<sup>2</sup>/kcal      B) 7.35 min<sup>2</sup>/kcal      C) 4.9 min<sup>2</sup>/kcal      D) 8.57 min<sup>2</sup>/kcal

9) The concentration of a certain drug in the bloodstream  $t$  minutes after swallowing a pill containing the drug can be approximated using the equation  $C(t) = \frac{1}{2}(3t + 1)^{-1/2}$ , where  $C(t)$  is the concentration in arbitrary units and  $t$  is in minutes. Find the rate of change of concentration with respect to time at  $t = 16$  minutes. 9) \_\_\_\_\_

A)  $-\frac{3}{1372}$  units/min      B)  $-\frac{3}{28}$  units/min  
 C)  $-\frac{1}{14}$  units/min      D)  $-\frac{1}{1372}$  units/min

10) Researchers have found that the maximum number of successful trials that a laboratory rat can complete in a week is given by 10) \_\_\_\_\_

$$P(t) = 55(1 - e^{-0.3t}),$$

where  $t$  is the number of weeks the rat has been trained. What is the maximum number of successful trials that a laboratory rat can complete in a week after being trained for 3 weeks.

A) 33      B) 14      C) 77      D) 5

## Answer Key

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- 1) D
- 2) C
- 3) D
- 4) A
- 5) B
- 6) B
- 7) C
- 8) A
- 9) A
- 10) A