MA 223 Exam 2 Summer 2006

Circle the correct answer for problems 1-2. Place your answer for problem 3 in the space provided. You must show your work to receive any credit.

(6 pts) 1. The distance, *s*, (in kilometers) a car has traveled after *t* hours is given by $s(t) = 64t + \frac{10}{3}t^2 - \frac{2}{9}t^3$. Find the acceleration of the car after 2 hours.

A. $\frac{8}{3}\ km/hr^2$

B. $4\ km/hr^2$

C. $\frac{224}{3}\ km/hr^2$

D. $64\ km/hr^2$

E. None of the above

(6 pts) 2. Let *y* be a differentiable function such that *y* is a function of *u* and $u(x) = x^2 - 4x + 1$. Also given is the fact that $\frac{dy}{du} = -5$ when $x = 1$. Use the chain rule to find $\frac{dy}{dx}$ when $x = 1$.

A. 10

B. -5

C. -15

D. 2

E. Cannot be determined

(6 pts) 3. The weekly cost (in dollars) of manufacturing Comfort Stride treadmills is given by $C(x) = 0.0005x^3 - 0.02x^2 + 450x + 8000$ where *x* represents the number of treadmills manufactured. Find the marginal cost of manufacturing the 201st unit ($x = 200$).

Place your answers in the spaces provided. You must show your work to receive any credit.

4. Find $\frac{dy}{dx}$ for each of the following. Simplify each answer.

(10 pts) (a) $y = (x+2)(2x^2 - 5x + 1)$

$\frac{dy}{dx} =$ [ ]

(10 pts) (b) $y = \frac{4x^2 + 1}{3 - x^2}$

$\frac{dy}{dx} =$ [ ]

(12 pts) (c) $4y^3 - x^4y^2 = 5x - 3$

$\frac{dy}{dx} =$ [ ]

Place your answers in the spaces provided. You must show your work to receive any credit.

(10 pts) 5. Let f be the function defined by $f(x) = 2x^3 + \frac{1}{x^2}$. Use differentials to approximate the change in f if x changes from 4 to 4.2. Round your answer to the nearest tenth.

$\Delta f \approx$ ____

(8 pts) 6. Find the second derivative of the function given by $f(x) = \sqrt{2x+1}$. Simplify your answer.

$f''(x) =$ ____

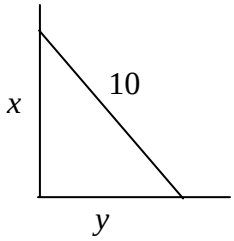
(12 pts) 7. Find the slope of the line tangent to the graph of $f(x) = (2x-1)^3(2x+3)^2$ at $x = 0$.

Slope = ____

Place your answers in the spaces provided. You must show your work to receive any credit.

(8 pts) 8. It is estimated that t years from now, the population of a certain community will be $P(t) = 20 - \frac{6}{t+1}$ thousand. At what rate will the population be changing with respect to time 4 years from now?

(12 pts) 9. A 10 foot long ladder leans against the side of a wall. The top of the ladder is sliding down the wall at the rate of 3 feet per second. How fast is the bottom of the ladder moving away from the building when the top is 6 feet above the ground? Use the picture below to use the same variables to represent your quantities.



ANSWERS

1. B

2. A

3. $502

4. (a) $\frac{dy}{dx} = 6x^2 - 2x - 9$

   (b) $\frac{dy}{dx} = \frac{26x}{\left(3 - x^2\right)^2}$

   (c) $\frac{dy}{dx} = \frac{5 + 4x^3y^2}{12y^2 - 2x^4y}$

5. $\Delta f \approx 19.2$

6. $f''(x) = -\frac{1}{(2x+1)^{\frac{3}{2}}}$

7. slope = 42

8. 240 people/year

9. 2.25 ft/sec.