Chapter 4 Test   October 19, 2016   Name

1. Find the x – coordinate(s) of the absolute extreme values of $f(x) = x^{\frac{2}{3}}(3 - x)$ Justify your answer and be sure to indicate max or min.

2. $f(x) = (3x - 2)^2(2x + 5)^3$ Find all critical values for this function. Provide the x – values only, and these would be potential local maxes and mins.

3. $f(x) = x^3 - \frac{15}{2}x^2 + 18x - 10$ Use the Second Derivative Test to find all local extreme values (x – values only) for the function on the interval $(-\infty, \infty)$ (be sure to use the second derivative explicitly in this test)

4. $f(x) = \frac{x + 1}{x}$ Find the number(s) c that satisfies the Mean Value Theorem on the interval $\left[\frac{1}{2}, 2\right]$

5. $f(x) = 2x\sqrt{3 - x}$ Find where the function is increasing and decreasing on its domain.

6. $f(x) = 2x^2 + 3x + 4$ If $x_1 = -1$, use Newton′s Method to find x_2 and x_3.

7. If $f(x) = ax^3 + bx^2 + 1$, then find a and b if the function has a point of inflection at the point $(-2, 3)$

8. $f(x) = \sec(4x)$ Find the linearization $L(x)$ for $f(x)$ at $a = \frac{-\pi}{6}$.

9. Use differentials to approximate the change in the function $y = 2\log_3(3x^3)$ as x changes from 9 to 9.5

10. Find (a) $\lim_{x \to 0^+} f'(x)$, (b) $\lim_{x \to 0^-} f'(x)$, (c) $\lim_{h \to 0^+} \dfrac{f(0+h) - f(0)}{h}$, and (d) $\lim_{h \to 0^-} \dfrac{f(0+h) - f(0)}{h}$ if

$$f(x) = \begin{cases} x + \cos\left(\dfrac{x}{2}\right) & x < 0 \\ x^2 + x & x \geq 0 \end{cases}$$

11. A right triangle whose hypotenuse is $\sqrt{3}$ meters long is revolved about one of its legs to create a right circular cone. Find the radius, height, and volume of the cone of greatest volume.

12. A 20 foot long ladder is leaning against a wall. The bottom of the ladder is sliding away from the wall at a rate of $4 \frac{\text{feet}}{\text{second}}$. How fast is the area of the triangle created changing when the distance from the wall to the bottom of the ladder is 12 feet?

13. A straight piece of wire of length w is bent into the shape of an L. What is the shortest possible distance between the ends? Be sure to use calculus to solve this problem.

14. A camera is located 50 feet from a straight road along which a car is traveling at 100 feet per second. The camera turns so that it is pointed at the car at all times. In radians per second, how fast is the camera turning as the car passes closest to the camera?