Math 151
Spring 2004

Exam 2 Review

NOTE: You need to know the formulas for area, volume, surface area, etc. of the basic geometric objects such as triangles, rectangles, cylinders, cones, spheres, etc.

(1.) Find the derivative of $f(x)$ using the definition of derivative.

(a.) $f(x) = \frac{1}{\sqrt{x}}$ **(b.)** $f(x) = x^3 + x$

(2.) Find the derivative of $f(x)$. JUSTIFY EACH STEP

(a.) $f(x) = \sin^3(2x+1)$ **(b.)** $f(x) = \frac{x^2+1}{\sec x}$

(3.) Find the indicated derivatives: (DO NOT SIMPLIFY)

(a.) $f(x) = \frac{1}{(4-x^2)^{3/2}}$; $f'(x)$ **(b.)** $f(x) = \frac{3x+1}{2x-1}$; $f''(x)$

(c.) $r = \tan[\sin(t^2)]$; $\frac{dr}{dt}$ **(d.)** $y = \sin(\cos 5x) + x^{7/3}$; $D_x(y)$

(e.) $y = \sec x^3$; $\frac{d^2y}{dx^2}$ **(f.)** $g(x) = \frac{x}{x^2+1}$; $g'(x)$

(4.) Suppose that the position of a particle at time t is given by $s(t)$. Find the velocity and the acceleration of this particle at the the given time:

(a.) $s(t) = \cos \frac{\pi t}{4}$ when $t = 1$ **(b.)** $s(t) = (t^2+1)^{10}$ when $t = 1$

(5.) Find $\frac{dy}{dx}$ given that

(a.) $y^2 = \frac{x}{x^2+y^2}$ **(b.)** $xy^2 = \sec(xy) + \tan(xy^2)$

(6.) Find the equation of the line which is tangent to the given curve at the given point:

(a.) $x^3 + 3xy - y^3 = 1$ at $(0, -1)$ **(b.)** $y = \tan(xy)$ at $(\frac{\pi}{4}, 1)$

(7.) Suppose that a 10ft ladder is leaning against a wall. Moreover, suppose that the bottom of the ladder is moving away from the foot of the wall at a rate of 3ft/sec. At what rate is the top of the ladder moving down the wall when the top of the ladder is 6ft from the ground?

(8.) Consider a triangle with legs l_1 and l_2 and their included angle θ. Suppose θ is decreasing at a rate of 1 radian/sec, the length of leg l_1 is increasing at a rate of 3ft/sec and the length of leg l_2 is decreasing at a rate of 2ft/sec. Find the rate of change of the area of this triangle when $\theta = \pi/4$, $l_1 = 4$ft long and $l_2 = 5$ft. Is the area of the triangle increasing or decreasing? (Hint: $A = \frac{l_1 l_2 \sin\theta}{2}$)