Quiz 2(Take-home)

MAT175 Section B402

Due: October 30th, 2012, before class.

Instructions: This is a take-home quiz. You can receive any kind of help to complete this quiz, but the answer sheet should be completed by your own handwriting. This quiz is aimed at the level of the departmental final exam. While doing this quiz, try to understand material thoroughly by looking up the textbook and asking questions, particularly if there is any question which is not clear to you. If handed-in by the above due date and the time, additional 10 points will be given — Do not pile up assignments! Each problem worth 10 points each unless stated otherwise. You can receive up to 100 points.

1. Find the derivative with respect to the variable x of the following:
(1)$f(x) = 2x^3 + 4x^2 + 3x$ (2) $f(x) = \sqrt[3]{x} + \sqrt[5]{x}$

2. Find the derivative with respect to the variable x of the following:
(1)$f(x) = \frac{x^3}{2\sin x+1}e^x$ (2) $f(x) = \sqrt{x}e^x + \ln x^2$.

3. Prove the following by using the definition of the derivative:

$$\frac{d}{dx}\ln x = \frac{1}{x}$$

4. Prove the following:

$$\frac{d}{d\theta}\cot\theta = -\csc^2\theta$$

5. Find constants a and b such that the function is differentiable on the entire real number line.(10 points)

$$f(x) = \begin{cases} \cos x & \text{if } x < 0 \\ ax + b & \text{if } x \geq 0 \end{cases}$$

6. Show that the graph of the function

$$f(x) = x^9 + 7x^7 + 3x^3 + 9x$$

does not have a tangent line with a slope of 8.

[7. – 10.] A particle is in motion following the position function $s(t) = s_0 + v_0 t - \frac{1}{2}gt^2$ where $s_0 > 0$ is the initial position, $v_0 > 0$ is the initial velocity, and g is the gravitational constant(approximately $9.8m/s^2$).
7. Find the velocity function $v(t)$ and the acceleration function $a(t)$.

8. Describe the motion by drawing position-time, velocity-time and acceleration-time graphs. (15 points)

9. Find the maximum of the position function $s(t)$. What is the velocity at the time when $s(t)$ is maximum? (5 points)

10. Find the time and the velocity when $s(t) = 0$.