

MTH 151**Exam 2****Fall 2011**

Show all work in a neat and organized fashion. Clearly indicate your answers.
100 points possible.

0. (10 pts.) Submit your take-home problem. If you didn't do it yet, you must do it during this exam class period.

1. (20 pts.) Differentiate each function. You do not have to simplify your answers.

(a) $y = (2x^3 + 3)(x^4 - 2x)$

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

(c) $y = \frac{x \sin x}{1 + x}$

(d) $y = \cos(\tan x)$

2. (10 pts.) Refer to the figure on the attached page, showing the graphs of the functions f and g .

(a) Let $P(x) = f(x)g(x)$. Find $P'(2)$.

(b) Let $C(x) = f(g(x))$. Find $C'(2)$.

3. (10 pts.) Find dy/dx by implicit differentiation.

$$3xy + 4y^2 = 22$$

4. (10 pts.) A particle moves according to a law of motion $s = f(t)$, $t \geq 0$, where t is measured in seconds and s in feet.

$$f(t) = t^3 - 12t^2 + 21t$$

(a) What is the velocity after 3 seconds?

(b) When is the particle at rest?

(c) When $t = 3$, is the particle speeding up, slowing down, or neither?

5. (10 pts.) A bug starts crawling north at 3 mm/sec from a point P . Fifteen seconds later, a second bug starts crawling east at 5 mm/sec from the same point P . At what rate is the distance between the bugs increasing 30 seconds after the second bug started crawling?

6. (10 pts.) (a) Find the linearization $L(x)$ of the function at a .

$$f(x) = \sqrt{x}, \quad a = 625$$

(b) Use your answer to part (a) (or use differentials) to estimate the given number.

$$\sqrt{638}$$

7. (10 pts.) Find the absolute maximum and absolute minimum values of f on the given interval. (Use an approved calculus method.)

$$f(x) = 3x^4 - 8x^3 - 90x^2 + 1, \quad [-6, 1]$$

8. (10 pts.) Verify that the function satisfies the hypotheses of the Mean Value Theorem on the given interval. Then find all numbers c that satisfy the conclusion of the Mean Value Theorem.

$$f(x) = 5x^2 - 3x + 8, \quad [-2, 3]$$