Exam #4 · Thursday, December 4, 2008

MATH 124 · Calculus I · Section 26 · Fall 2008 Name _____

Problem 1. Let

$$x(t) = 2t^3 - 15t^2 + 24t + 7$$
$$y(t) = t^2 + t + 1.$$

Find all values of t such that this curve has a vertical tangent line.

Problem 2.
Part (a). Find the average value of

$$G(y) = \frac{A}{y} + By$$

over the interval $-4 \leq y \leq -1$, where A and B are positive constants.

Part (b). If the units of y and $G(y)$ are inches and gallons, respectively, what are the units of the average value found in part (a)?

Problem 3. Suppose the rate of change of the price of a stock is $R(t)$ where t is measured in days since the start of the year and $R(t)$ is dollars per day.

Part (a). What are the units of $\int_{31}^{59} R(t)dt$?

Part (b). Give a practical interpretation of $\int_{31}^{59} R(t)dt$.

Part (c). If $R(t) < 0$ for $30 \leq t \leq 60$, can you tell what the sign of $\int_{31}^{59} R(t)dt$ is? If so, what is the sign? If not, why not?

Part (d). If $R(t) < 0$ for $30 \leq t < 40$ and $R(t) > 0$ for $40 < t \leq 60$, can you tell what the sign of $\int_{31}^{59} R(t)dt$ is? If so, what is the sign? If not, why not?

Problem 4. Find the exact area of the region between $f(x) = x^{2/3}$ and $g(x) = \sin(x)$ over the interval $1/8 \leq x \leq \pi$.

Problem 5. Label the following statements as correct (C) or incorrect (I):
Part (a). If $f'(x) < 0$ on an interval then $f(x)$ is decreasing on that interval.

Part (b). If $f'(x) = 0$ at a point then $f(x)$ has an inflection point at that point.

Part (c). If $f'(x)$ has a maximum or minimum at a point then $f(x)$ has a critical point there.

Problem 6. Let

$$\frac{dP}{dt} = t(1-t).$$

Part (a). Find a general solution for P.

Part (b). Find a specific solution for P if $P(3) = 2$.

Problem 7. Let $F(x) = \int_{10}^{x} f(t)dt$, with the following known values for $f(t)$:

t	0	10	20	30	40
$f(t)$	-1.25	-1.2	-1.1	-0.9	-0.7

Estimate $F(20)$ and $F(30)$.

Problem 8.
Part (a). Find

$$\frac{d}{d\theta} \int_{\pi/2}^{\theta} \frac{\sin(x)}{x} dx.$$

Part (b). Find

$$\frac{d}{d\theta} \int_{\pi/2}^{\pi - e^{-\theta}} \frac{\sin(x)}{x} dx.$$