

CALCULUS AND ANALYTIC GEOMETRY I - MAT 250

FALL 2008 - Review 2

I. State whether each statement is **True** or **False** as stated. Provide a clear reason for your answer.

- The notation fg denotes the function whose value at x is $f(g(x))$

- $\left. \frac{d}{dx} (fg) \right|_{x=4} = f(4)g'(4) - g(4)f'(4)$

- Suppose that $f'(4) = g(4) = g'(4) = 1$. Then we have enough information to compute $F'(4)$, where $F(x) = f(g(x))$.

II. Compute $f'(x)$ using the limit definition, for $f(x) = x^2 + x$.

III. Find the equation of the tangent line to $y = xe^x$ at $x = 1$.

IV. Assign the labels $f(x)$, $g(x)$ and $h(x)$ to the graphs in Figure 1 in such a way that $f'(x) = g(x)$ and $g'(x) = h(x)$.

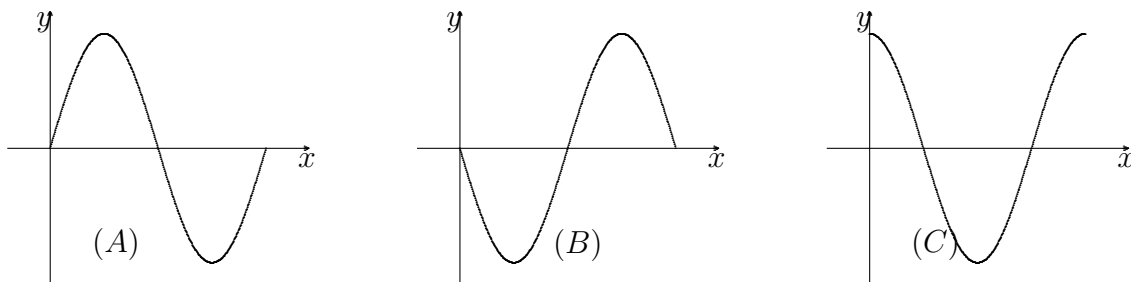


Figure 1:

A _____

B _____

C _____

V. What is the derivative of f/g at $x = 1$ if $f(1) = f'(1) = g(1) = 2$, and $g'(1) = 4$.

VI. (20 points) Calculate the derivatives of the given functions:

• $f(x) = e^x(x^3 - 1)$

$y = (x^4 - x + 2)^{-3/2}$

• $f(t) = 6\sqrt{t} + \frac{1}{\sqrt{t}}$

$y = \sec(\sqrt{t^2 - 9})$

• $f(x) = x^2(1 + 4e^x)$

$y = \tan(e^{5-6x})$

• $f(x) = (x - x^2) \cot x$

$y = \sqrt{1 + \sqrt{1 + \sqrt{x}}}$

• $f(x) = \frac{x^4 - 4}{x^2 - 5}$

$f(\theta) = \frac{1 + \tan \theta}{1 - \tan \theta}$

• $f(x) = \frac{1 + \sin x}{1 - \sin x}$

VIII. Compute $F''(2)$ given that $F(x) = \frac{x^2}{x - 3}$.

IX.

• It takes a stone 3 s to hit the ground when dropped from the top of a building. How high is the building and what is the stone's velocity upon impact?

• A ball is tossed up vertically from ground level and returns to earth 4 s later. What was the initial velocity of the stone and how high did it go?