CALCULUS AND ANALYTIC GEOMETRY I - MAT 250

FALL 2008 - Review 3

No. I. State whether each statement is **True** or **False** as stated. Provide a clear reason for your answer.

i) $\tan(arctanx) = x$.

ii) The derivative of the inverse of a differentiable function is the inverse of the derivative of the function.

iii) If x and y are differentiable functions of t and $y = x^2$, then $y'' = 2[(x')^2 + xx'']$.

iv) $\dfrac{d}{dx}b^x = (\ln b)b^x \qquad$ for $b < 0$.

v) Given that $\sinh x = \dfrac{e^x - e^{-x}}{2}$, we can conclude that $\sinh x$ is never zero.

No. II. Calculate the derivative of y with respect to x.

- $\tan(x^2y) = x + y$

- $x^{\frac{1}{2}} + y^{-\frac{1}{2}} = 2xy$

No. III. Find $g'(8)$, where $g(8)$ is the inverse of a differentiable function $f(x)$ such that $f(-1) = 8$ and $f'(-1) = 12$.

No. IV. Use logarithmic differentiation to compute the derivative of $y = \dfrac{x \cos x}{(x+1)\sin x}$

No. V. Find the derivative:

- $f(x) = \ln(x + e^x)$
- $G(s) = \tan^{-1}(\sqrt{s})$
- $f(x) = \ln(\csc^{-1} x)$
- $y = e^{\sec^{-1} x}$
- $g(t) = \sinh(t^2)$
- $h(y) = y \tanh(4y)$
- $g(t) = \sqrt{t^2 - 1} \sinh^{-1} t$
- $g(x) = \tanh^{-1}(e^x)$

No. VI.

- A bead slides down the curve $xy = 10$. Find the bead's horizontal velocity if its height at time t seconds is $y = 80 - 16t^2$ cm.
- A $6 - ft$ man walks away from a $15 - ft$ lamppost at a speed of $3ft/s$. Find the rate at which his shadow is increasing in length.