MT-A142-09 Exam Two Fall 2003

You may keep this page of questions. Turn in your answers with all of your work on the pink paper. FOR THIS EXAM YOU ARE NOT ALLOWED TO USE CALCULATORS OR THE COMPUTER.

(1)  8 Points. Find both \( f'(x) \) and \( f''(x) \) if \( f(x) = 3 \cos(10x) \).

(2)  8 Points. Find \( \frac{dx}{dt} \) if \( x = t^3 \arcsin(t) \).

(3)  8 Points. Find \( g'(x) \) if \( g(x) = \ln \left( x^5 + 12\sqrt{x^3} \right) \).

(4)  8 Points. Find \( \frac{dz}{d\theta} \) if \( z = \sec(e^{5\theta}) \).

(5)  8 Points. Find \( f'(x) \) and simplify if \( f(x) = \frac{x^2 + 3}{(x^2 - 6)^4} \).

(6)  12 Points. In the following table, values are given for \( f(x), g(x), f'(x) \) and \( g'(x) \). Let \( p(x) = f(x)g(x) \) be the product, \( q(x) = f(x)/g(x) \) be the quotient and \( \text{cmp}(x) = f(g(x)) \) be the composition.

<table>
<thead>
<tr>
<th>x</th>
<th>f(x)</th>
<th>g(x)</th>
<th>f'(x)</th>
<th>g'(x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>8.0</td>
<td>0.6</td>
<td>-15.0</td>
<td>-1.20</td>
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<td>-4.0</td>
<td>-0.80</td>
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<td>0.2</td>
<td>-6.0</td>
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<td>2.5</td>
<td>0.1</td>
<td>-8.0</td>
<td>0.20</td>
</tr>
<tr>
<td>1.0</td>
<td>3.0</td>
<td>0.4</td>
<td>2.0</td>
<td>1.50</td>
</tr>
</tbody>
</table>

(a) Find \( p'(0.8) \).  
(b) Find \( q'(0.6) \).  
(c) Find \( \text{cmp}'(0.2) \).

(7)  10 Points. Find \( \frac{dy}{dx} \) by implicit differentiation if \( x^3 \ln(y) + 3x = y^3 \).

(8)  12 Points. Find a parametric description for the straight line which passes through the points \((-1, 4)\) and \((4, -3)\).

(9)  10 Points. Find a function \( g(x) \) such that \( g'(x) = 3x^2 \csc^2(x^3) \).

(10) (a)  4 Points. Sketch a graph of \( y = f(x) = 4^x \).

(b)  2 Points. On the same coordinate axes, include a sketch of the straight line \( \ell \) which is tangent to \( y = 4^x \) at the point \( (\frac{1}{2}, 2) \).

(c)  6 Points. Find an equation for the straight line \( \ell \) which is tangent to \( y = 4^x \) at the point \( (\frac{1}{2}, 2) \).

(d)  4 Points. Find an exact value for the \( x \)-intercept of the straight line \( \ell \).