Math 220 (section ???) **Quiz 12** **Spring 2011**

Name _____

- You have 15 minutes
- No calculators
- Show sufficient work

1. (3 points each) Let **R** be the region bounded by the x-axis and the graph of $y = e^{-x}$ on the interval $[1, 3]$. Set up, but do not evaluate, definite integrals which represent the given quantities. Use proper notation.

   (a) The volume of the solid obtained when **R** is revolved around the line $y = 2$.

   (b) The volume of the solid with base **R** for which the cross-sections perpendicular to the x-axis are squares.

2. (2 points) Precisely state the *Mean Value Theorem*.

3. (2 points) Explain carefully why $f(x) = x^7 + 5x^3 + 2x - 20$ cannot have two real roots.