MATH 104 Workshop 6

Related Rates. Mean Value Theorem.

If you didn't attend workshop, submit solutions to problems 2 and 4.

1. The volume of a right circular cylinder is 60 cm^3 and is increasing at 2 cm^3 min^{-1} at a time when the radius is 5 cm and is increasing at a rate of 1 cm min^{-1}. How fast it the height of the cylinder changing at that time?

2. A water tank in the shape of an inverted right circular cone with the top radius 10 m and depth 8 m. Water is flowing in at a rate of 0.1 m^3 min^{-1}.

   (a) How fast is the depth of the of the water in the tank increasing when the water is 4 m deep?

   (b) If there is a leak in this tank and water leaks out at a rate of $\frac{h^3}{1000}$ m^3 min^{-1} when the depth of the water in the tank is h m. How full can the tank get in this case.

3. State the Mean Value Theorem and Rolle's Theorem. Identify Rolle's Theorem as a special case of Mean Value Theorem.

4. Let $f(x) = e^x + (1-e)x^2 - 1$. Show that there exists a real number c such that $f'(c) = 0$.