

## BASIC MATHEMATICS – Ph.D. Qualifying Exam Spring 2007

**Problem 1 (10 pts)**

Solve the following differential equation:

$$\frac{dx}{dt} = t + 2tx$$

subject to the initial condition that  $x(0) = 0$

**Problem 2 (10 pts)**

Consider the three-dimensional ellipsoid described by:

$$x^2 + 2y^2 + 3z^2 = 6$$

Find an equation for the plane that is tangent to this ellipsoid at the point  $x = y = z = 1$ . Please express your answer in the form  $z = f(x, y)$ .