Math 231: QUIZ #2 NAME:

Show all of your work as partial credit will be given.

1. Using the separation of variables method explicitly solve the O.D.E. below for x:

$$\frac{dx}{dt} = 3x\cos t.$$

2. Using the separation of variables method explicitly solve the I.V.P. below for y:

$$\frac{dy}{dx} = 6x^2e^{-y},\ y(1) = 0.$$

Solutions

Problem 1.

(i) First, we separate the variables:

$$\frac{dx}{x} = 3\cos t\ dt.$$

(ii) Then we integrate both sides:

$$\int \frac{dx}{x} = \int 3\cos t\ dt.$$

(iii) Therefore, all solutions satisfy to

$$\ln x = 3\sin t + c,$$

where c is a constant, or

$$x = \exp(3\sin t + c).$$

Problem 2.

(i) First, we separate the variables:

$$e^y\ dy = 6x^2\ dx.$$

(ii) Then we integrate both sides:

$$\int e^y\ dy = \int 6x^2\ dx.$$

(iii) Therefore, all solutions satisfy to

$$e^y = 2x^3 + c,$$

where c is a constant, or

$$y = \ln(2x^3 + c).$$

From the initial conditions,

$$0 = \ln(2 + c).$$

Therefore, $c = -1$, and the solution of the initial value problem is

$$y = \ln(2x^3 - 1).$$