Name_____

Student I.D._____

Math 2250-4
Quiz 2 SOLUTIONS
January 18, 2013

1a) Find the general solution to the differential equation for $x(t)$

$$x'(t) = 3x - 6$$

Using the method for separable differential equations.

(5 points)

$$\frac{dx}{dt} = 3(x - 2)$$

$$\frac{dx}{x - 2} = 3\,dt$$

$$\int \frac{dx}{x - 2} = \int 3\,dt$$

$$\ln|x - 2| = 3t + C_1 \,.$$

exponentiate:

$$|x - 2| = e^{C_1}e^{3t}$$

$$x - 2 = Ce^{3t}$$

$$x = 2 + Ce^{3t}$$

1b) Solve the same differential equation

$$x'(t) = 3x - 6$$

using the method for linear differential equations.

(5 points)

$$x'(t) - 3x = -6\,.$$

The integrating factor is $e^{\int -3\,dt} = e^{-3t}$:

$$e^{-3t}(x'(t) - 3x(t)) = e^{-3t}(-6) = -6e^{-3t}\,.$$

$$\frac{d}{dt}\left(e^{-3t}x(t)\right) = -6e^{-3t}\,.$$

$$e^{-3t}x(t) = \int -6e^{-3t}\,dt = 2e^{-3t} + C\,.$$

Divide by the exponential, i.e. multiply by e^{3t}:

$$x(t) = 2 + Ce^{3t}\,.$$