NAME & EID: Solutions

M 427K Quiz 1   **September 5, 2012**   **Instructor: James Pascaleff**

- Show all work.

- No books, calculators, or other electronic devices.

1. Consider the ordinary differential equation

$$\frac{dy}{dt} = -2y + 10$$

Find the solution to this equation that satisfies the initial condition $y(0) = 7$.

$$\frac{dy}{dt} = -2(y-5) \longrightarrow \int \frac{dy}{y-5} = \int -2\,dt$$

$$\longrightarrow \ln|y-5| = -2t + \text{constant} \longrightarrow y - 5 = ce^{-2t}$$

$$\longrightarrow \quad y = 5 + ce^{-2t}$$

initial cond: $7 = 5 + ce^{-2\cdot 0} = 5 + c \longrightarrow c = 2$

So $\boxed{y(t) = 5 + 2e^{-2t}}$

2. How does this solution behave as t goes to ∞?

As $t \to \infty$, $e^{-2t} \to 0$

so $y(t) = 5 + 2e^{-2t} \to 5$

The solution converges asymptotically to 5.