

Instructions: Show all work. **Give exact answers** (yes, that means fractions, square roots and exponentials, and not decimals) unless specifically directed to give a decimal answer. This will require some operations to be done by hand even if not specifically directed to. Be sure to complete all parts of each question.

1. Use Euler's method to estimate the value of $y(3)$.

$$\frac{dy}{dt} = y(2 - ty), y_0(2) = 1, n = 3, y(3) = ?$$

$$\Delta t = \frac{3-2}{3} = \frac{1}{3}$$

$$y_0 = 1 \quad m = (1)(2 - 2(1)) = 0 \quad y_1 = m\Delta t + y_0 \quad t_0 = 2$$

$$y_1 = 0(y_0) + 1 = 1 \quad t_1 = \frac{7}{3}$$

$$m = 1(2 - \frac{7}{3} \cdot 1) = -\frac{1}{3} \quad y_2 = m\Delta t + y_1$$

$$y_2 = -\frac{1}{3}(1) + 1 = \frac{2}{3} \quad t_2 = \frac{8}{3}$$

$$y_3 = \quad m = \frac{2}{3}(2 - \frac{8}{3}(\frac{2}{3})) = \frac{2}{3}(2 - \frac{16}{9}) = \frac{-8}{27}$$

$$-\frac{8}{27}(\frac{2}{3}) + \frac{2}{3} = \frac{56}{243} \quad \text{or } \approx .229 \quad t_3 = 3$$

$$y(3) \approx .779$$