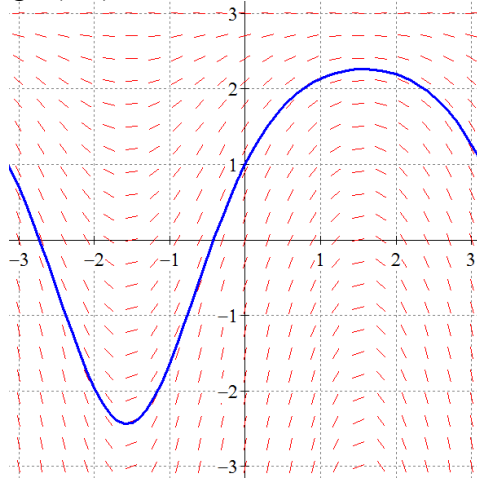


2014 AB #6  
(no calculator)

$$\frac{dy}{dx} = (3-y)\cos x \quad \text{and } f(0) = 1$$

(a) Solution curve through (0,1):



(b) slope of the tangent line at (0,1) =  $\left. \frac{dy}{dx} \right|_{(0,1)} = (3-1)\cos(0) = 2$

Equation of tangent line at (0,1) is:  $y - 1 = 2(x - 0)$

$f(0.2) \approx 1 + 2(0.2 - 0) = 1.4$

(c)

$$\frac{dy}{dx} = (3-y)\cos x$$

$$\frac{dy}{3-y} = \cos x \, dx$$

$$\int \frac{dy}{3-y} = \int \cos x \, dx$$

$$-\ln|3-y| = \sin x + C \quad \Rightarrow \quad -\ln|3-1| = \sin 0 + C \quad \Rightarrow \quad C = -\ln 2$$

and drop absolute value sign since  $3-1 > 0$

$$-\ln(3-y) = \sin x - \ln 2$$

$$\ln(3-y) = \ln 2 - \sin x$$

$$3-y = e^{(\ln 2 - \sin x)}$$

$$y = 3 - e^{(\ln 2 - \sin x)} \quad \text{or} \quad y = 3 - 2e^{-\sin x}$$