AP Calculus BC Quiz 1 Name: Block: Seat:

1. *(Inspired by 2007 form B, #5, which used steps of $\frac{1}{2}$ on a No Calculator question– feel free to use a calculator today)* Consider the differential equation $\frac{dy}{dx} = 2x + 3y - 1$

   (a) (2 points) Find $\frac{d^2y}{dx^2}$ in terms of x and y

   (b) (2 points) Let $y = f(x)$ be a particular solution to the differential equation with the initial condition $f(0) = -2$. Use Euler's method, starting at $x = 0$ with a step size of 0.25 , to approximate $f(1)$. Show the work that leads to your answer.

   (c) (1 point) Explain why you think part (b) is either an underestimate or an overestimate.

(d) (2 points) Let $y = g(x)$ be another solution to the differential equation $\frac{dy}{dx} = 2x + 3y - 1$ with the initial condition $g(0) = k$, where k is a constant. Euler's method, starting at $x = 0$ with a step size of 1, gives the approximation $g(1) \approx 0$. Find the value of k.

Bonus (2 points): Find the values of the constants m, b and r for which $y = mx + b + e^{rx}$ is a solution to the differential equation $\frac{dy}{dx} = 2x + 3y - 1$