AP Calculus BC Mr. Shubleka Quiz: 50

Present neatly ~~on separate paper~~. Justify for full credit. No Calculators.

Name Key / D.S. Score ______ A (10 minutes) **x1**

1)

Use Euler's Method to approximate $f(1)$ with step size $\Delta x = 0.5$ if $y = f(x)$ is a solution and the initial condition is (0, 1).

$$\frac{dy}{dx} = x + y + 1$$

(see other section)

Illustrate your solution with a graph.

2)

Solve the following differential equation. Find the specific solution by using the initial condition (1, 3).

$$\frac{dy}{dt}\frac{1+t^2}{y} = 1$$

$$\frac{1}{y}\,dy = \frac{1}{1+t^2}\,dt$$

$$\int \frac{1}{y}\,dy = \int \frac{1}{1+t^2}\,dt$$

$$\ln|y| = \arctan t + C$$

$$|y| = e^{\arctan t + C} \quad @ \ (1, 3)$$

$$y = \pm e^{\arctan t + C}$$

$$3 = e^{\arctan 1 + C}$$

$$3 = e^{\pi/4 + C} \rightarrow C = \ln 3 - \frac{\pi}{4}$$

$$y = e^{\arctan t} \cdot \frac{e^{\ln 3}}{e^{\pi/4}} = \frac{3 \cdot e^{\arctan t}}{e^{\pi/4}}$$

AP Calculus BC Mr. Shubleka Quiz: 50

Present neatly ~~on separate paper~~. Justify for full credit. No Calculators.

Name KEY / DS. Score ______ F (10 minutes) **x1**

1)

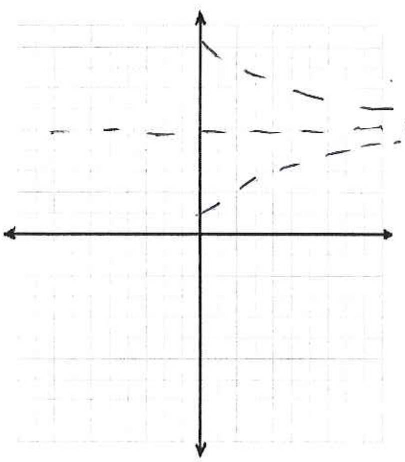
Describe the differential equation in as much detail as possible.

$$\frac{dP}{dt} = 0.1P\left(1-\frac{P}{1000}\right)$$

$0 < P < 1000 \Rightarrow \frac{dP}{dt} > 0$ population grows.

$1000 < P \Rightarrow dP/dt < 0$ population decreases.

What happens to the population in the long run if $P_0=750$? What if $P_0=1300$? Explain.



- If $P_0 = 750$, the population grows.
- If $P_0 = 1300$, the population decrease
- In both situations, $P(t)$ approaches 1000.

2)

Use Euler's Method to approximate $f(1)$ with step size $\Delta x = 0.5$ if $y = f(x)$ is a solution and the initial condition is (0, 1).

$$\frac{dy}{dx} = x + y + 1$$

Illustrate your solution with a graph.

x	y	dy/dx	
0	1	2	$y-1=2(x-0)$
0.5	2	3.5	$y-2=3.5(x-0.5)$
1	3.75		$y = 2+\frac{3.5}{2}$

$f(1) \approx 3.75$