Khoi Vo **MATH_046_001_21F**

Assignment 3.1_Euler_Method due 11/06/2021 at 11:59pm PDT

$\dot{y} = F(t, y)$

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1. (1 point)

Let $y(t)$ be the solution to $\dot{y} = 8te^{-y}$ satisfying $y(0) = 3$.

(a) Use Euler's Method with time step $h = 0.2$ to approximate $y(0.2), y(0.4), \ldots, y(1.0)$.

k	t_k	y_k
0	0	3
1	0.2	___
2	0.4	___
3	0.6	___
4	0.8	___
5	1.0	___

(b) Use separation of variables to find $y(t)$ exactly.

$y(t) =$ __________

(c) Compute the error in the approximations to $y(0.2)$, $y(0.6)$, and $y(1)$.

$|y(0.2) - y_1| =$ __________

$|y(0.6) - y_3| =$ __________

$|y(1) - y_5| =$ __________

Answer(s) submitted:

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(incorrect)

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3. (1 point) Use Euler's method with the given step size to estimate $y(1.4)$ where $y(x)$ is the solution of the initial-value problem

$$y' = x - xy, \quad y(1) = 1.$$

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1. Estimate $y(1.4)$ with a step size $h = 0.2$.

Answer: $y(1.4) \approx$ __________

2. Estimate $y(1.4)$ with a step size $h = 0.1$.

Answer: $y(1.4) \approx$ __________

Answer(s) submitted:

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(incorrect)

$y_1 = y_0 + h \cdot y(k=0,\ t=0)$ "y" $= 0$

$= 3 + 0.2 * (8 \cdot 0\, e^{-0})$

$= 3 + 0.2 * (8 * 0 * 1) = 3$

$y_2 = y_1 + h \cdot F(t=2,\ \text{"}y\text{"} = 3)$

$= 3 + 0.2 * (8 \cdot 2 \cdot e^{-3}) = \ldots$

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1. (1 point)

A continuous annuity with withdrawal rate N = \$1,400/year and interest rate r = 5

(a) When will the annuity run out of funds if $P_0 = \$23,000$?

The annuity runs out after approximately ________ years.
Answer to the nearest whole year.

(b) Which initial deposit P_0 yields a constant balance? P_0 = \$ ________

Answer(s) submitted:

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(incorrect)

The instantaneous rate of change of the value of a certain investment (P) is proportional to its value. That is to say $\frac{dP}{dt} = rP$.

If $r = 7$ and $P(0) = 3500$:

$P(t) =$ ________________.

Answer(s) submitted:

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(incorrect)

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1. (1 point) A tank contains 100 kg of salt and 2000 L of water. Pure water enters a tank at the rate 6 L/min. The solution is mixed and drains from the tank at the rate 3 L/min.

(a) What is the amount of salt in the tank initially?
amount = ________ (kg)

(b) Find the amount of salt in the tank after 5 hours.
amount = ________ (kg)

(c) Find the concentration of salt in the solution in the tank as time approaches infinity. (Assume your tank is large enough to hold all the solution.)
concentration = ________ (kg/L)

Answer(s) submitted:

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(incorrect)

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2. (1 point) A tank contains 100 kg of salt and 2000 L of water. A solution of a concentration 0.025 kg of salt per liter enters a tank at the rate 7 L/min. The solution is mixed and drains from the tank at the same rate.

a.) What is the concentration of our solution in the tank initially?

concentration = ________ (kg/L)

b.) Find the amount of salt in the tank after 4.5 hours.

amount = ________ (kg)

c.) Find the concentration of salt in the solution in the tank as time approaches infinity.

concentration = ________ (kg/L)

Answer(s) submitted:

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(incorrect)

2/ $x^2 y' = y^2 + xy - x^2$, $y(1) = 2$

"Bernoulli"

* If $x^2 = 0 :\Rightarrow x = 0$: $0 = y^2 + 0 - 0 \Rightarrow y = 0$.

* If $x^2 \neq 0$: $y' = \frac{1}{x^2} y^2 + \frac{1}{x} y - 1$

$$y' - \frac{1}{x} y = \frac{1}{x^2} y^2 - 1$$

(*) $y' - \frac{1}{x} y = 0$: $y' = \frac{1}{x} y$: $\frac{y'}{y} = \frac{1}{x}$: $\ln y = \ln x$

$$y_1 = x$$

* Step2: $y = u \cdot x \Rightarrow y' = u'x + u$

$$u'x + u - \frac{1}{x}(ux) = \frac{1}{x^2}(ux)^2 - 1$$

$$u'x + u - u = u^2 - 1 \Rightarrow u'x = u^2 - 1$$

$$\frac{u'}{u^2 - 1} =$$