Homework

BC Calculus

Differential Equations

Do these problems **without** a calculator.

Name Guide Pd.__

Additional Differential Equations Day 2

1. Use Euler's method with step size 0.5 to compute the approximate y-values $y_1, y_2, y_3,$ and y_4 of the solution of the initial–value problem $y' = xy - x^2$, $y(1) = 0$.

x	$\Delta x \cdot y'$	y
1	$\frac{1}{2}[xy - x^2]$	0
1.5	$\frac{1}{2}[(1)(0) - (1)^2] = \frac{1}{2}(-1) = \frac{-1}{2}$	0 − 1/2 **−1/2**
2	$\frac{1}{2}[\frac{3}{2}(\frac{-1}{2}) - (\frac{3}{2})^2] = \frac{1}{2}[\frac{-12}{4}] = \frac{-3}{2}$	−1/2 − 3/2 **−2**
2.5	$\frac{1}{2}[2(-2) - (2)^2] = \frac{1}{2}[-8] = -4$	−2 − 4 **−6**
3	$\frac{1}{2}[\frac{5}{2}(-6) - (\frac{5}{2})^2]$ $\frac{-60}{4} - \frac{25}{4}$ $\frac{1}{2}[\frac{-85}{4}]$ −10.625	−6 − 10.625 **−16.625**

2. Use Euler's method with step size 0.2 to estimate y(0.4), where y(x) is the solution of the initial-value problem $y' = x + y^2$, $y(0) = 0$.

Do these problems **with** a calculator and check with a calculator

3. Use Euler's method with step size 0.2 to estimate y(1), where y(x) is the solution of the initial-value problem $y' = xy - x^2$, $y(0) = 1$.

x	$\Delta x \cdot y'$	y
0	$(.2)[xy - x^2]$	1
.2	$(.2)[0(1) - (0)^2] = 0$	1+0 **1**
.4	$(.2)[(.2)(1) - (.2)^2] = .032$	1+.032 **1.032**
.6	$(.2)[(.4)(1.032) - (.4)^2] = .05056$	1.032+.05056 **1.08256**
.8	$(.2)[(.6)(1.08256) - (.6)^2]$ .0579072	1.08256+ .0579072 **1.140467**
1	$(.2)[(.8)(1.140467) - (.8)^2]$ .054474	1.140467+ .054474 **1.1949**

4. Use Euler's method with step size 0.1 to estimate y(0.5), where y(x) is the solution of the initial-value problem $y' = y + xy$, $y(0) = 1$.

BC Calculus
Differential Equations

Name________________________Pd.__
Additional Differential Equations Day 2

5. **Calculator** Use Euler's method with step size 0.1 to estimate y(0.4), where y(x) is the solution of the initial-value problem
$y' = x + y^2$, $y(0) = 0$.

6. **Non-Calculator** Use Euler's method with step size 0.5 to estimate y(2), where y(x) is the solution of the initial-value problem
$y' = xy - x$, $y(0) = 1$.

7. Use Euler's method with step size 0.5 to estimate y(2) where y(x) is the solution to the initial value problem $y' = x(y - x)$, $y(1) = 2$

a. 2.125 b. 2 c. 3 d. 2.75 e. 3.25

Review

R1. If $f(x) = x + \sin x$, then $f'(x) =$

a. $1+\cos x$ b. $1-\cos x$ c. $\cos x$ d. $\sin x - x\cos x$ e. $\sin x + x\cos x$

R2. If $y = \cos^2(3x)$, then $\frac{dy}{dx} =$

$y = [\cos(3x)]^2$
Rewrite & use chain Rule 2 times

a. $-6\sin 3x\cos 3x$ b. $-2\cos 3x$ c. $2\cos 3x$ d. $6\cos 3x$ e. $2\sin 3x\cos 3x$

R3. If $y = \cos^2 x - \sin^2 x$, then $y' =$

$y = [\cos x]^2 - [\sin x]^2$

Remember $\sin(2x) = 2\sin x \cdot \cos x$

a. -1 b. 0 c. $-2\sin 2x$ d. $-2(\cos x + \sin x)$ e. $2(\cos x - \sin x)$

Answers

1. $y_1 = -0.5$, $y_2 = -2$
   $y_3 = -6$, $y_4 = -16.625$
2. $y(0.4) \approx 0.04$
3. $y(1) \approx 1.1949$
4. $y(0.5) \approx 1.7616$
5. $y(0.4) \approx 0.0601$
6. $y(2) \approx 1$
7. C

R1. A
R2. A
R3. C