Homework 05

● Graded

Student

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Total Points

9 / 10 pts

Question 1

Completion

8 / 8 pts

✔ **– 0 pts** Complete

– 2 pts Mostly complete

– 4 pts Half complete

– 6 pts Mostly incomplete

– 8 pts Incomplete

Question 2

Correctness of 9.1#14?

1 / 2 pts

– 0 pts Correct

✔ **– 1 pt** Partially correct

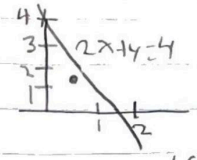
– 2 pts Incomplete or incorrect

need to check the initial condition as well

Homework #5

8.3

25



$\bar{x} = \frac{1}{A}\int_0^2 x\cdot(4-2x)\,dx = \frac{1}{4}\int_0^2 4x-2x^2 = \frac{1}{2}\int_0^2 2x-x^2\,dx = \left(\frac{x^2}{2}-\frac{x^3}{3}\right)\frac{1}{2}\Big|_0^2 = \frac{2}{3}$

$\bar{y} = \frac{1}{4}\int_0^2 \frac{1}{2}(4-2x)^2 = \frac{1}{2}\int_0^2 4-4x+x^2\,dx = \frac{1}{2}\left(4x-2x^2+\frac{x^3}{3}\right)\Big|_0^2 = \frac{4}{3}$

centroid: $\left(\frac{2}{3},\frac{4}{3}\right)$

8.5

1.a) Probability of random tire having 30K – 40K miles

1.b) Probabilty random tire at least 25K miles

6.a) $1 = K\int_0^3 3x-x^2\,dx$: $\frac{1}{K} = \frac{3x^2}{2}-\frac{x^3}{3}\Big|_0^3$ $\frac{1}{K} = \frac{27}{6}$ $K = \boxed{\frac{2}{9}}$

6.b) $= \int_1^3 \frac{2(3x-x^2)}{9} + \int_3^\infty 0\,dx = \frac{2}{9}\int_1^3 (3x-x^2)\,dx = \frac{2}{9}\left(\frac{3x^2}{2}-\frac{x^3}{3}\right)\Big|_1^3 = \boxed{\frac{20}{27}}$

6c) $k\int_0^3 3x^2-x^8 = k\left(x^3-\frac{x^9}{4}\right)\Big|_0^3 = \frac{27k}{4} = \frac{27\left(\frac{2}{9}\right)}{4} = \boxed{\frac{3}{2}}$

9.1

4.) $\frac{dy}{dt} = ky(N-y)$

5.) $\frac{dy}{dt} = k(N-y)$

6. $y = \sin x - \cos x$; $y' + y = 2\sin x$

$y' = \cos x + \sin x$; $\cos x + \sin x + \sin x - \cos x = 2\sin x$

$2\sin x = 2\sin x$ ✓ yes

8. $y = \tan x$; $y' - y^2 = 1$

$y' = \sec^2 x$; $\sec^2 x - \tan^2 x = 1$

$1 = 1$ ✓ yes

10. $y = \sqrt{1-x^2}$; $yy' - x = 0$

$y' = \frac{-x}{\sqrt{1-x^2}}$ $\sqrt{1-x^2}\left(\frac{-x}{\sqrt{1-x^2}}\right) - x = 0$

$-x - x = 0$ $-2x = 0$ X no

12. $y = \ln x$; $xy'' - y' = 0$

$y' = \frac{1}{x}$ $\quad \frac{-x}{x^2} - \frac{1}{x} = 0$

$y'' = -\frac{1}{x^2}$ $\quad -\frac{2}{x} = 0$ not solution ✗ no

14 $y = 5e^{2x} + x$; $\frac{dy}{dx} - 2y = 1 - 2x$, $y(0) = 5$

$y' = 10e^{2x} + 1$; $10e^{2x} + 1 - 10e^{2x} - 2x = 1 - 2x$

$1 - 2x = 1 - 2x$ yes ✓

22.a) $v(v^2 - (1+a)v + a) = 0$

$v(v-1)(v-a) = 0$

$v = 1$ $v = a$, $v = 0$

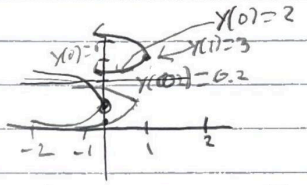
22.b $(-\infty, 0) \cup (0, a) \cup (a, 1) \cup (1, \infty)$

$\frac{dv}{dt} > 0$ when v $(-\infty, 0) \cup (a, 1)$

22.c decreasing at $(0, a) \cup (1, \infty)$

9.2

2.A



2.b) $y = 2$ $y = 4$ because horizontal on graph

$\tan(\frac{1}{2}\pi \cdot 2) = \tan \pi = 0$

$\tan(\frac{1}{2}\pi \cdot 4) = \tan 2\pi = 0$

$y = 2$, $y = 4$

Gtbicul

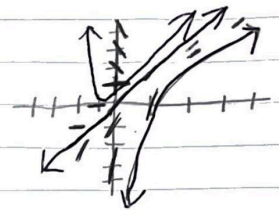
3. if $y=2$ $y'=0$
graph 3

4 $y' = 2x - yx$
$y' - 2x = -yx$
$y = y' - x$
$y = 2 \to y' = 2$
graph 1. $y=2$ has 0 slope at $y=2$

5. graph 4
$y = -x+1$ $y' = -1$
true in 4

6. graph 2, only one left.

10. $y' = x - y + 1$



$(0,0) = 0-0+1 = 1$
$(1,0) = 0-1+1 = 0$
$(0,1) = 1-0+1 = 2$
$(-3,0) = 0+3+1 = 4$

21. $y' = x-2x$, $y(0)=0$ step size 0.5 $= h$
$y_1 = y_0 + hF(x_0, y_0)$
$(x_0, y_0) = (1,0)$

n	x_n	y_n	$F(x_n, y_n)$
0	1	0	−2
1	1.5	−1	−4
2	2	−3	−7
3	2.5	−6.5	−11.5
4	3	−12.25	−18.25

$y_1 = 0 + 0.5(-2) = -1$
$y_2 = -1 + 0.5(-4) = -2 = -3$
$y_3 = -3 + 0.5(-7) = -3.5 = -6.5$
$y_4 = -6.5 + 0.5(11.5) = -12.25$

24.a) step size 0.2 $= h$ to estimate $y(0.6)$, $y' = \cos(x+y)$ $y(0) = 0$
$y_1 = y_0 + hF(x_0, y_0)$
$F(x_0, y_0) = (0,0)$

n	x_n	y_n	$F(x_n, y_n)$
0	0	0	1
1	0.2	0.2	$\cos(0.4)$
2	0.4	0.3842	.7842
3	0.6		

$y_1 = 0 + 0.2(1) = 0.2$
$y_2 = 0.2 + 0.2(\cos 0.4)$
$0.4\cos(0.4)$
$y_3 = 0.3842 + 0.2\cos(.7842)$
$= 0.5298$

$y(0.6) \approx 0.5526$