How to Upload Homework

Homework assignments are submitted online. Write your solutions on paper (clearly, concisely and legibly). Then scan your homework into your computer, preferably as a .pdf document. Finally, upload your homework to Canvas.

$dx \quad x$

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

$u = y+1$

$du = dy$

$$\int \frac{1}{\sqrt{u}}\,du$$

$$\int u^{-\frac{1}{2}}\,du$$

$$2\sqrt{u} + C_1 = \int x^{-\frac{1}{2}}\,dx$$

$$2\sqrt{y+1} + C_1 = 2\sqrt{x} + C_2$$

$$2\sqrt{y+1} = 2\sqrt{x} + C \quad \text{where } C = C_2 - C_1$$

$$\sqrt{y+1} = \sqrt{x} + \tfrac{1}{2}C$$

$$y+1 = (\sqrt{x} + \tfrac{1}{2}C)^2$$

$$C^2 + 4C - 12 = 0$$

$$(C+6)(C-2) = 0$$

$C = -6$ ✓ $C = 2$ ✓

$$y = (\sqrt{x} - 3)^2 - 1$$

or

$$y = (\sqrt{x} + 1)^2 - 1$$

Elliott Jacobs

Only C = 2. See comment below

Elliott Jacobs

18/20 Please note that if y(1) = 3, then this equation already implies that C = 2

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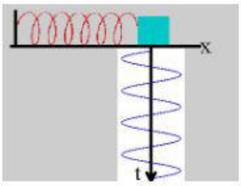

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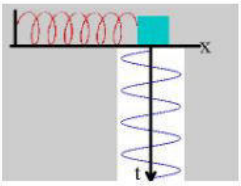

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Assignment 1 - First order differential equations
Available until Sep 5 at 7:00pm | **Due** Sep 2 at 9pm | -/100 pts

Assignment 2 - Exact Differential Equations
Available until Sep 10 at 11:59pm | **Due** Sep 6 at 9pm | -/100 pts

Assignment 3 - Integrating Factors
Available until Sep 14 at 11:59pm | **Due** Sep 10 at 9pm | -/100 pts

Assignment 4 - First Order Linear Equations
Available until Sep 17 at 11:59pm | **Due** Sep 15 at 9pm | -/100 pts

Exam 1
Not available until Sep 22 at 3:45pm | **Due** Sep 22 at 5pm | -/100 pts

Assignment 6 - Introduction to Matrix Algebra
Available until Sep 27 at 11:59pm | **Due** Sep 24 at 9pm | -/100 pts

Assignment 7 - Inverses
Available until Oct 5 at 11:59pm | **Due** Sep 27 at 9pm | -/100 pts

Assignment 8 - Eigenvectors and Eigenvalues
Available until Oct 10 at 11:59pm | **Due** Oct 6 at 9pm | -/100 pts

Assignment 9 - Matrix Differential Equations

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Assignment 9 - Matrix Differential Equations

Details

Write your solutions on paper using a dark ink (blue or black). Scan your work and upload it to Canvas in pdf format.

Show all essential work but be concise with your solutions.

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Assignment 1. *Introduction to Differential Equations. Separation of Variables*

Read 1.1, 1.2, 2.1 and 2.2
You should be able to do the following problems:
Exercise 1.2 Problems 1 - 15, Exercise 2.2 Problems 7 - 26
Hand in the following problems:

Solve the following differential equations for problems 1 - 3.

1.
$$\frac{dy}{dx} = \frac{y}{2\sqrt{x}} \qquad y(1) = 1$$

2.
$$\frac{dy}{dx} = \frac{y(y+1)}{x}$$

3.
$$\frac{dy}{dx} + xy = x \qquad y(0) = 2$$

4. Scientists at the University of Nebraska Medical Center performed an experiment to determine the rate at which pancreatic cancer cells grow. Approximately 500,000 pancreatic cancer cells were injected into the pancreas of each laboratory rat and the number of cells was observed growing over a three week period. If $y(t)$ represents the population of cancer cells in a particular rat after t hours, then $y(t)$ solves the following differential equation:

$$\frac{dy}{dt} = ky \qquad \text{(where } k \text{ is a positive constant)}$$

a. Solve this differential equation and obtain a formula for $y(t)$.

b. The scientists determined experimentally that $k = 0.05 \ln 2$. Calculate how long it takes for the population of cancer cells to double.

5. Let $M(t)$ denote the mass of a radioactive object after t years. The fact that the rate at which the mass is decreasing is proportional to the mass itself leads to the differential equation:

$$\frac{dM}{dt} = -\lambda M \quad \text{where } \lambda \text{ is a constant}$$

a. Solve this differential equation and obtain a formula for $M(t)$.

b. Suppose for a particular radioactive substance we begin with 4 grams. If the mass is down to 1 gram after 1 year, calculate the constant λ

Exercise 1.2 Problems 1 - 15. Exercise 2.2 Problems 7 - 26

Hand in the following problems:

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I've made a short video on some applications of separation of variables. Click here to see it.

Click here for Assignment 1 problems

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$\partial u = \langle 1, 0, -1 \rangle$

$\partial v = \langle 0, 1, -1 \rangle$

$$\partial u \times \partial v = \begin{vmatrix} i & j & k \\ 1 & 0 & -1 \\ 0 & 1 & -1 \end{vmatrix}$$

$i(0+1) - j(-1-0) + k(1-0)$

$= (1, 1, 1)$

$$\int_0^1 \int_0^1 \langle u, v, 1-u-v \rangle \cdot \langle 1, 1, 1 \rangle$$

$[u]_0^1 \cdot [v]_0^1 = 1$

(4) $\langle x, y, z \rangle = \langle u\cos v, u\sin v, u^2 \rangle$

where $\frac{1}{2} \le u \le 1$ \$ $0 \le v \le 2\pi$

$$\begin{vmatrix} \cos u & \sin v & 0 \\ -u\sin v & u\cos v & 2u \end{vmatrix} \quad 2u\sin v \; - 2u\cos v + u\cos^2 v \; u\sin^2 v$$

$$\sqrt{(2u\sin v)^2 + (-2u\cos v^2) + u^2}$$

$\sqrt{5u^2} = \sqrt{5}\,u$

$$\int_0^{2\pi} \int_0^1 \sqrt{5}\,u \Rightarrow \frac{\sqrt{5}}{2}(2\pi - 0) = \sqrt{5}\,\pi$$

Audrey Buehler

15/20 Dot product is where the terms are all added together, the correct term to integrate is sqrt(3)!

Audrey Buehler

15/20 The correct term inside of the integral is usqrt(1+4u^2)!