First Assignment_Math2C03 (15872328)

Question	1	2	3	4	5	6	7	8	9	10

1. Question Details ZillDiffEQ9 1.1.005. [4568144] -

State the order of the given ordinary differential equation.

$$\frac{d^2y}{dx^2} = \sqrt{1 + \left(\frac{dy}{dx}\right)^6}$$

[ ]

Determine whether the equation is linear or nonlinear by matching it with (6) in Section 1.1.

$$a_n(x)\frac{d^ny}{dx^n} + a_{n-1}(x)\frac{d^{n-1}y}{dx^{n-1}} + \cdots + a_1(x)\frac{dy}{dx} + a_0(x)y = g(x) \qquad (6)$$

- linear
- nonlinear

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2. Question Details ZillDiffEQ9 1.1.060. [3745065] -

Consider the differential equation $dy/dx = 7 - y$.

(a) Either by inspection or by the concept that $y = c$, $-\infty < x < \infty$, is a constant function if and only if $y' = 0$, find a constant solution of the DE.

$y =$ [ ]

(b) Using only the differential equation, find the intervals on the y-axis on which a nonconstant solution $y = \varphi(x)$ is increasing. Find the intervals on the y-axis on which $y = \varphi(x)$ is decreasing. (Enter your answer using interval notation.)

increasing [ ]

decreasing [ ]

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3. Question Details ZillDiffEQ9 1.2.015. [3744975] -

Determine by inspection two solutions of the given first-order IVP.

$$y' = 3y^{2/3}, \quad y(0) = 0$$

$y(x) =$ [ ] (constant solution)

$y(x) =$ [ ] (polynomial solution)

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4. Question Details ZillDiffEQ9 1.2.018.EP. [4603932]

Consider the following differential equation.

$$\frac{dy}{dx} = \sqrt{xy}$$

Let $f(x, y) = \sqrt{xy}$. Find the derivative of f.

$\frac{\partial f}{\partial y} =$ ______

Determine a region of the xy-plane for which the given differential equation would have a unique solution whose graph passes through a point (x_0, y_0) in the region.

- There is a unique solution in any rectangular region where $x > 0$ and $y > 0$ or $x > 0$ and $y < 0$.
- There is a unique solution in any rectangular region where $x < 0$ and $y > 0$.
- There is a unique solution in the region $x \le y$.
- There is a unique solution in any rectangular region where $x > 0$ and $y > 0$ or $x < 0$ and $y < 0$.
- There is a unique solution in the entire xy-plane.

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5. Question Details ZillDiffEQ9 1.2.026.EP. [4603960]

Consider the differential equation $y' = \sqrt{y^2 - 9}$.

Let $f(x, y) = \sqrt{y^2 - 9}$. Find the partial derivative of f.

$\frac{df}{dy} =$ ______

Determine a region of the xy-plane for which the given differential equation would have a unique solution whose graph passes through a point (x_0, y_0) in the region.

- A unique solution exits in the region consisting of all points in the xy-plane except $(0, 3)$ and $(0, -3)$.
- A unique solution exits in the regions $y < -3$, $-3 < y < 3$, and $y > 3$.
- A unique solution exists in the region $-3 < y < 3$.
- A unique solution exits in the entire xy-plane.
- A unique solution exists in the region $y < -3$ or $y > 3$.

Determine whether Theorem 1.2.1 guarantees that the differential equation possesses a unique solution through $(6, 3)$.

- Yes
- No

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6. Question Details ZillDiffEQ9 2.2.036. [4568043]

Find a solution of $x \frac{dy}{dx} = y^2 - y$ that passes through the indicated points.

(a) (0, 1)

y =

(b) (0, 0)

y =

(c) $\left(\frac{1}{6}, \frac{1}{6}\right)$

y =

(d) $\left(6, \frac{1}{8}\right)$

y =

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7. Question Details ZillDiffEQ9 1.2.030. [3876483] -

(a) Verify that $y = \tan(x + c)$ is a one-parameter family of solutions of the differential equation $y' = 1 + y^2$.

- Differentiating $y = \tan(x + c)$ we get $y' = 1 + \sec^2(x + c)$ or $y' = 1 + y^2$.
- Differentiating $y = \tan(x + c)$ we get $y' = \tan^2(x + c)$ or $y' = 1 + y^2$.
- Differentiating $y = \tan(x + c)$ we get $y' = \csc(x + c)$ or $y' = 1 + y^2$.
- Differentiating $y = \tan(x + c)$ we get $y' = 1 + \tan^2(x + c)$ or $y' = 1 + y^2$.
- Differentiating $y = \tan(x + c)$ we get $y' = \sec(x + c)$ or $y' = 1 + y^2$.

(b) Since $f(x, y) = 1 + y^2$ and $\partial f/\partial y = 2y$ are continuous everywhere, the region R in Theorem 1.2.1 can be taken to be the entire xy-plane. Use the family of solutions in part (a) to find an explicit solution of the first-order initial-value problem $y' = 1 + y^2$, $y(0) = 0$.

$y =$ ______

Even though $x_0 = 0$ is in the interval $(-2, 2)$, explain why the solution is not defined on this interval.

Since $\tan(x)$ is discontinuous at $x = \pm$(______), the solution is not defined on $(-2, 2)$.

(c) Determine the largest interval I of definition for the solution of the initial-value problem in part (b). (Enter your answer using interval notation.)

______

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8. Question Details ZillDiffEQ9 2.R.002. [3744818] -

Fill in the blanks.

The initial-value problem $x\frac{dy}{dx} - 7y = 0$, $y(0) = k$, has an infinite number of solutions for ---Select--- and no solution for ---Select--- .

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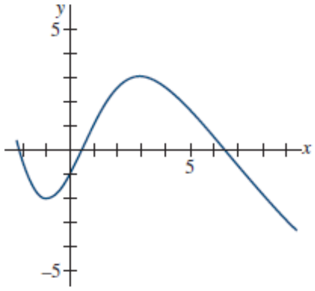
9. Question Details ZillDiffEQ9 1.2.037. [3745195] -

The graph of a member of a family of solutions of a second-order differential equation $d^2y/dx^2 = f(x, y, y')$ is given. Match the solution curve with at least one pair of the following initial conditions. (Select all that apply.)



- $y(1) = 1,\ y'(1) = -2$
- $y(-1) = 0,\ y'(-1) = -4$
- $y(1) = 1,\ y'(1) = 2$
- $y(0) = -1,\ y'(0) = 2$
- $y(0) = -1,\ y'(0) = 0$
- $y(0) = -4,\ y'(0) = -2$

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10. Question Details ZillDiffEQ9 2.R.034. [4568325] -

Solve the given initial-value problem.

$$\frac{dy}{dt} + 2(t + 1)y^2 = 0, \quad y(0) = -\frac{1}{3}$$

$y(t) =$

Give the largest interval I on which the solution is defined. (Enter your answer using interval notation.)

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