1. (1 point)
Match each of the following differential equations with a solution from the list below.

___1. $y'' + 4y' + 4y = 0$
___2. $y'' + y = 0$
___3. $y'' - 4y' + 4y = 0$
___4. $2x^2y'' + 3xy' = y$

A. $y = \cos(x)$
B. $y = e^{-2x}$
C. $y = \dfrac{1}{x}$
D. $y = e^{2x}$

Answer(s) submitted:

-
-
-
-

(incorrect)

2. (1 point) Match each differential equation to a function which is a solution.

FUNCTIONS
A. $y = 3x + x^2$,
B. $y = e^{-2x}$,
C. $y = \sin(x)$,
D. $y = x^{\frac{1}{2}}$,
E. $y = 4\exp(5x)$,
DIFFERENTIAL EQUATIONS

___1. $xy' - y = x^2$
___2. $2x^2y'' + 3xy' = y$
___3. $y'' + 8y' + 12y = 0$
___4. $y' = 5y$

Answer(s) submitted:

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-
-

(incorrect)

3. (1 point)
Match the solutions to the differential equations. If there is more than one solution to an equation, select the answer that includes all solutions.

___1. $\frac{dy}{dx} = -7y$
___2. $\frac{d^2y}{dx^2} = -49y$
___3. $\frac{d^2y}{dx^2} = 49y$
___4. $\frac{dy}{dx} = 7y$

A. $y = e^{-7x}$ or $y = e^{7x}$
B. $y = 7\sin(x)$
C. $y = e^{7x}$
D. $y = e^{-7x}$
E. $y = \sin(7x)$
F. $y = \sin(7x)$ or $y = 7\sin(x)$

Answer(s) submitted:

-
-
-
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(incorrect)

4. (1 point)
Match the solutions to the differential equations. If multiple options could be correct for one of the differential equations, pick the option that includes all solutions.

___1. $y'' - 9y = 0$
___2. $x^2y'' + 2xy' - 2y = 0$
___3. $x^2y'' - 6y = 0$

A. $y = x^{-2}$ or $y = x$
B. $y = e^{4x}$
C. $y = e^{3x}$ or $y = e^{-3x}$
D. $y = x^{-2}$
E. $y = x^{-1}$
F. $y = x^6$ or $y = x^{-5}$

Answer(s) submitted:

-
-
-

(incorrect)

5. (1 point)
Which of the following functions are solutions of the differential equation $y'' - 5y' - 14y = 0$?

- A. $y(x) = 7x$
- B. $y(x) = 0$
- C. $y(x) = -2x$
- D. $y(x) = e^x$
- E. $y(x) = e^{-2x}$
- F. $y(x) = e^{-x}$
- G. $y(x) = e^{7x}$

Answer(s) submitted:

-

(incorrect)

1.2.

1/ A. $y = \cos x$

$y' = -\sin x$

$y'' = -\cos x$

$\cos x + (-\cos x) = 0$

$y + y'' = 0$

(2) → A

B. $y = e^{-2x}$

$y' = -2e^{-2x}$

$y'' = 4e^{-2x}$

$4e^{-2x} - 4(-2e^{-2x}) + 4e^{-2x} = 16e^{-2x}$ ≠ 2

$4e^{-2x} + (-2e^{-2x}) \cdot 4 + 4e^{-2x} = 0$

D: $y = e^{2x}$

$y' = 2e^{2x}$

$y'' = 4e^{2x}$

3: $4e^{2x} - 4(2e^{2x}) + 4e^{2x} = 0$

(1)

C → 4

$y = \frac{1}{x}$

$y' = \frac{-1}{x^2} \cdot \frac{-3}{3x} \rightarrow 3xy' = \frac{-3}{x}$

$y'' = \frac{2}{x^3} \cdot x^2 \rightarrow 2x^2y'' = \frac{4}{x}$

$3xy' + 2x^2y'' = \frac{-3}{x} + \frac{4}{x} = \frac{1}{x}$

$= y$

6. (1 point) The family of functions

$$y = ce^{-2x} + e^{-x}$$

is solution of the equation

$$y' + 2y = e^{-x}.$$

Find the constant c which defines the solution which also satisfies the initial condition $y(0) = 2$.

$c =$ _____

Answer(s) submitted:

-

(incorrect)

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$y' = -2ce^{-2x} - e^{-x}$

$+ 2y = 2ce^{-2x} + 2e^{-x}$

$x = 0, \; y = 2$

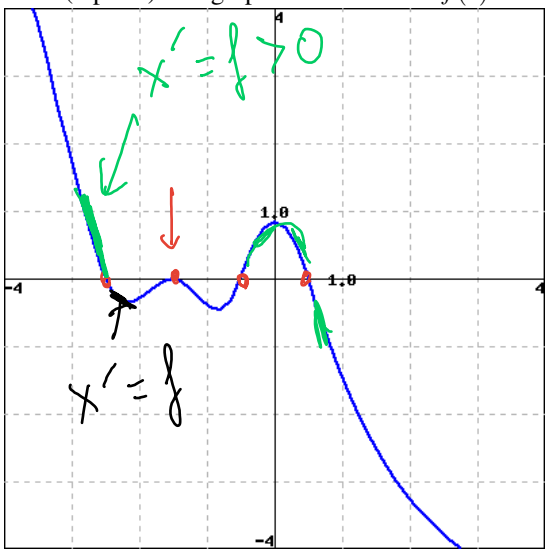
$2 = ce^{-2 \cdot 0} + e^{-0}$

$2 = ce^{0} + e^{-0}$

$2 = c \cdot 1 + 1$

$2 = c + 1 \longrightarrow c = 1$

1. (1 point) The graph of the function $f(x)$ is



(the horizontal axis is x.)

Given the differential equation $x'(t) = f(x(t))$

List the constant (or equilibrium) solutions to this differential equation in increasing order and indicate whether or not these equilibria are stable, semi-stable, or unstable.

_____ ?
_____ ?
_____ ?
_____ ?

Answer(s) submitted:

-
-
-
-
-

(incorrect)

2. (1 point)

Let $y(t)$ be a solution of $\dot{y} = \frac{1}{8}y(1-\frac{y}{8})$ such that $y(0) = 16$. Determine $\lim_{t\to\infty} y(t)$ without finding $y(t)$ explicitly.

$\lim_{t\to\infty} y(t) =$ _____

Answer(s) submitted:

-

(incorrect)

3. (1 point) Suppose that a population develops according to the logistic equation

$$\frac{dP}{dt} = 0.15P - 0.0015P^2$$

where t is measured in weeks.

(a) What is the carrying capacity? _____

(b) Is the solution increasing or decreasing when P is between 0 and the carrying capacity? ?

(c) Is the solution increasing or decreasing when P is greater than the carrying capacity? ?

Answer(s) submitted:

-
-
-

(incorrect)

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* equilibrium $x' =$ equation of x

when "$x' = 0$"

Directional Field : field of derivatives

$x = -2.5$

$x = -1.5$

$x = -0.5$

$x = 0.5$

* stable: real arrow close to it

$x' = f$