Differential Equations MATH 2073 Quiz-1

Instructions. In the differential equations below, \( y = y(t) \) is a function of independent variable \( t \). Simplify your answers when appropriate. Be sure to show your work so that it is clear how you got your answers.

1. Find the general solution of the equation \( y' - y = 12t^2e^t \)
   (This is the fourth equation in Problem 1.) Solution This is linear equation \( y' - y = 12t^2e^t \) with integrating factor \( e^{-t} \).
   
   \[
   e^{-t}y' - ye^{-t} = 12t^2 \\
   (e^{-t}y)' = 12t^2 \\
   e^{-t}y = 4t^3 + C
   \]

   So the answer is \( y = 4t^3e^t + Ce^t \) where \( C \) is an arbitrary constant.

2. Match the directional fields with the differential equations A, B, C below. (use arrows to indicate your matches)

   This is \( y' = ty(1 - y) \) (B)  
   This is \( y' = y(t - y) \) (C)  
   This is \( y' = y(1 - y) \) (A)
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1. Find the general solution of the equation \( y' - y = 6t^2e^t \)

   **Solution** This is linear equation \( y' - y = 6t^2e^t \) with integrating factor \( e^{-t} \).

   \[
   e^{-t}y' - ye^{-t} = 6t^2
   \]
   \[
   (e^{-t}y)' = 6t^2
   \]
   \[
   e^{-t}y = 2t^3 + C
   \]

   So the answer is \( y = 2t^3e^t + Ce^t \) where \( C \) is an arbitrary constant.

2. Match the directional fields with the differential equations A, B, C below. (use arrows to indicate your matches)

   ![Directional Fields]

   This is \( y' = y(t - y) \) (C)  This is \( y' = ty(1 - y) \) (B)  This is \( y' = y(1 - y) \) (A)
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Instructions. In the differential equations below, \( y = y(t) \) is a function of independent variable \( t \). Simplify your answers when appropriate. Be sure to show your work so that it is clear how you got your answers.

1. Find the general solution of the equation \( y' - y = 4te^t \)

   Solution This is linear equation \( y' - y = 4te^t \) with integrating factor \( e^{-t} \).

\[
e^{-t}y' - ye^{-t} = 4t
\]
\[
(e^{-t}y)' = 4t
\]
\[
e^{-t}y = 2t^2 + C
\]

So the answer is \( y = 2t^2e^t + Ce^t \) where \( C \) is an arbitrary constant.

2. Match the directional fields with the differential equations A, B, C below. (use arrows to indicate your matches)

   This is \( y' = y(1 - y) \) (A)  
   This is \( y' = ty(1 - y) \) (B)  
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Differential Equations MATH 2073 Quiz-1

Instructions. In the differential equations below, \( y = y(t) \) is a function of independent variable \( t \). Simplify your answers when appropriate. Be sure to show your work so that it is clear how you got your answers.

1. Find the general solution of the equation \( y' - y = 6te^t \)
   
   (This is the fourth equation in Problem 1.) Solution This is linear equation \( y' - y = 6te^t \) with integrating factor \( e^{-t} \).
   
   \[
e^{-t}y' - ye^{-t} = 6t
   \]
   
   \[
   (e^{-t}y)' = 6t
   \]
   
   \[
e^{-t}y = 3t^2 + C
   \]
   
   So the answer is \( y = 3t^2e^t + Ce^t \) where \( C \) is an arbitrary constant.

2. Match the directional fields with the differential equations A, B, C below. (use arrows to indicate your matches)

   - This is \( y' = y(1 - y) \) (A)
   - This is \( y' = y(t - y) \) (C)
   - This is \( y' = ty(1 - y) \) (B)