Started on	Thursday, 7 December 2023, 11:30 AM
State	Finished
Completed on	Thursday, 7 December 2023, 11:58 AM
Time taken	28 mins 30 secs
Grade	**12.00** out of 12.00 (**100**%)

Question **1**

Correct

Mark 2.00 out of 2.00

Determine whether the given differential equation is separable.

$$(xy^2 + 9y^2)\,dy - 2x\,dx = 0$$

a. Yes; because $\frac{dy}{dx} = g(x)p(y)$ where $g(x) = \frac{1}{x+9}$ and $p(y) = \frac{2x}{y^2}$.

b. Yes; because $\frac{dy}{dx} = g(x)p(y)$ where $g(x) = \frac{2x}{x+9}$ and $p(y) = \frac{1}{y^2}$. ✔

c. Yes; because $\frac{dy}{dx} = g(x)p(y)$ where $g(x) = \frac{x}{x+9}$ and $p(y) = \frac{1}{y^2}$.

d. No

The correct answer is: Yes; because $\frac{dy}{dx} = g(x)p(y)$ where $g(x) = \frac{2x}{x+9}$ and $p(y) = \frac{1}{y^2}$.

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Question **2**

Correct

Mark 2.00 out of 2.00

Identify which are solutions of the differential equation $t^2y'' + ty' + y = 0$.

a. $y_1(t) = \ln t, \quad y_2(t) = t \ln t$

b. $y_1(t) = \sin t, \quad y_2(t) = \cos t$

c. $y_1(t) = \sin(\ln t), \quad y_2(t) = \cos(\ln t)$ ✔

d. $y_1(t) = e^{\sin t}, \quad y_2(t) = e^{\cos t}$

The correct answer is: $y_1(t) = \sin(\ln t), \quad y_2(t) = \cos(\ln t)$

Question **3**

Correct

Mark 2.00 out of 2.00

Solve the initial value problem $y' = 2y + 3, \; y(0) = 2$.

a. $y(t) = -\frac{1}{2} + \frac{5}{2} e^{3t}$

b. $y(t) = -\frac{3}{2} + \frac{7}{2} e^{2t}$ ✔

c. $y(t) = -\frac{2}{3} + \frac{8}{3} e^{2t}$

d. $y(t) = 1 + e^{2t}$

The correct answer is: $y(t) = -\frac{3}{2} + \frac{7}{2} e^{2t}$

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Question **4**

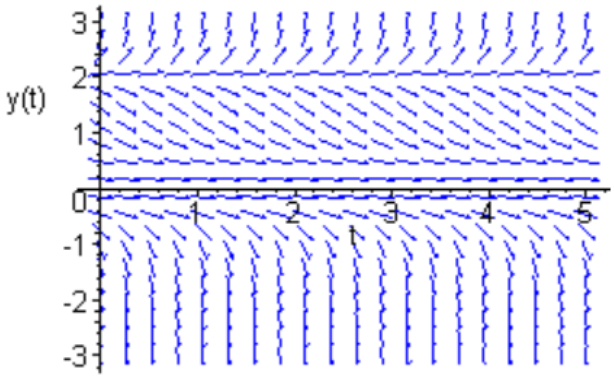
Correct

Mark 2.00 out of 2.00

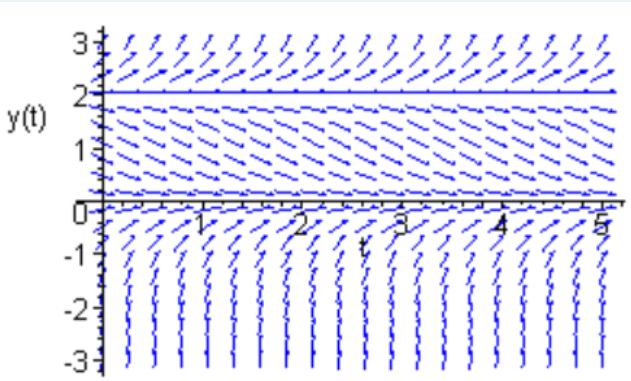
Which of the direction field plots below represents that of the differential equation

$$\frac{dy}{dt} = y\,(y-2)$$

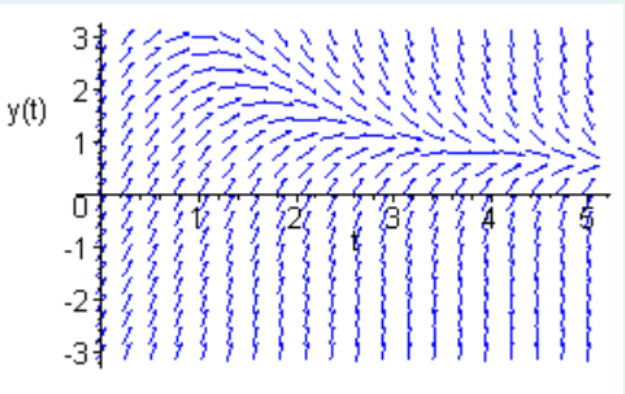
a.



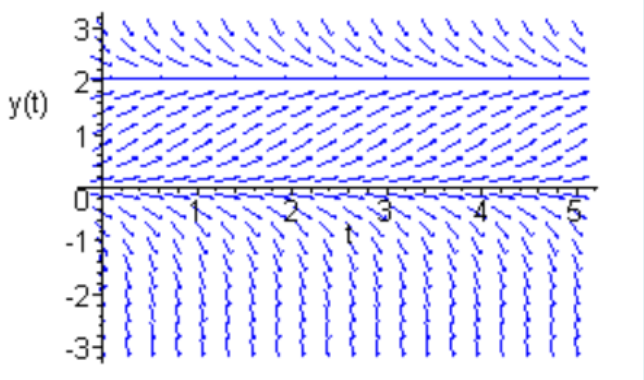
b. ✔



c.



d.



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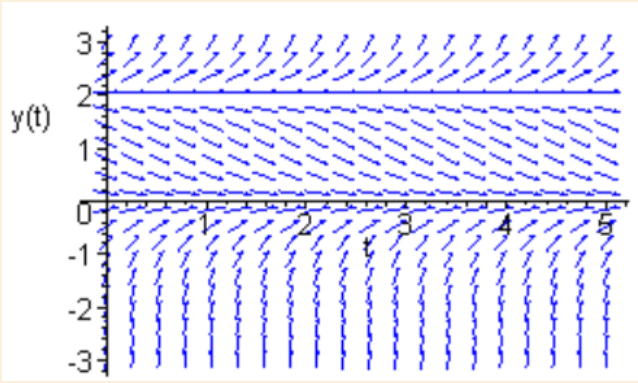
The correct answer is:



Question **5**

Correct

Mark 2.00 out of 2.00

Given the partial differential equation $4u_{xx} = u_t$. Which of the following is a solution to it?

a. $u(x,t) = 7e^{-4\alpha^2 t}\sin\alpha x - 5e^{-4\alpha^2 t}\cos\alpha x, \quad \text{all } \alpha$ ✔

b. $u(x,t) = 5\sin 4x\cosh t - 2\cos 4x\sinh t$

c. $u(x,t) = e^{-4\alpha t}\sin\alpha x + 3e^{-4\alpha t}\cos\alpha x, \quad \alpha > 1$

d. $u(x,t) = 2\cos t\sin\alpha x - 3\sin t\cos\alpha x, \quad \alpha > 0$

The correct answer is: $u(x,t) = 7e^{-4\alpha^2 t}\sin\alpha x - 5e^{-4\alpha^2 t}\cos\alpha x, \quad \text{all } \alpha$

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Question **6**

Correct

Mark 2.00 out of 2.00

Show for which values of r is the function e^{rt} a solution of $y'' + 5y' + 4y = 0$.

a. $r_1 = 4, \quad r_2 = 5$

b. $r_1 = 4, \quad r_2 = 1$

c. $r_1 = -4, \quad r_2 = -1$ ✔

d. There are no such values.

The correct answer is: $r_1 = -4, \quad r_2 = -1$

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