First order differential equations

Answers

Further Maths topic practice

This topic online

Q	Answer	Marks
1	$y = (6/5)e^{2x} + ce^{-3x}$	3
2	**a)** $y = x^3/5 + c/x^2$ **b)** $y = x^3/5 + 4/(5x^2)$	5
3	$y = \sin x + 5/(4 \sin x)$	5
4	**a)** $f(x) = (x^2/2 - 2)e^{-x^2}$ **b)** $x = 2$ **c)** $y \to 0$	6
5	$y = (x + 1)^4/2 - 3(x + 1)^2/4$	6
6	**a)** $y = (x \ln x)/2 - x/4 + 1/(4x)$ **b)** $e/4 + 1/(4e)$	7
7	**a)** shown **b)** shown **c)** $y = 45/2$	8
8	**a)** shown **b)** 2 **c)** 2	7
9	**a)** shown **b)** $k = 12$ **c)** 15.75 m s^{-}1 **d)** The model predicts $v \to \infty$ as $t \to \infty$, which is not realistic: resistance would limit the speed	9
10	**a)** shown **b)** $\theta = 22.5 - 0.5t + 62.5e^{-0.2t}$ **c)** 26.0 °C **d)** 5.62 minutes **e)** The kitchen temperature would keep falling without limit (below 0 °C after 40 minutes), which is unrealistic	10
11	**a)** 14 667 fish **b)** 1206 fish per year **c)** The model predicts the number of fish increases without limit, but the lake has limited food and space	10
12	**a)** shown **b)** $x = 0.2(200 + t) - 1\,200\,000/(200 + t)^2$ **c)** 46.7 kg **d)** 0.190 kg per litre; concentration $= 0.2 - 1\,200\,000/(200 + t)^3 < 0.2$	12

Full worked solutions, written out by hand, are on the solutions sheet for this topic.

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