Name_____
Calculus Practice: Differential Equations 1b

For each problem, find the particular solution of the differential equation that satisfies the initial condition.

1) $\dfrac{dy}{dx} = \dfrac{2x}{e^y}$, $y(2) = 0$

2) $\dfrac{dy}{dx} = \dfrac{3e^x}{y^2}$, $y(0) = \sqrt[3]{7}$

3) $\dfrac{dy}{dx} = \dfrac{2x}{e^{2y}}$, $y(-3) = \dfrac{\ln 16}{2}$

4) $\dfrac{dy}{dx} = \dfrac{2x^2}{y^2}$, $y(2) = \sqrt[3]{15}$

5) $\dfrac{dy}{dx} = 2y^2$, $y(-3) = \dfrac{1}{8}$

6) $\dfrac{dy}{dx} = \dfrac{-3 + x^2}{y^2}$, $y(-2) = \sqrt[3]{10}$

7) $\dfrac{dy}{dx} = 2x\sqrt{y}$, $y > 0$, $y(3) = \dfrac{9}{4}$

8) $\dfrac{dy}{dx} = xe^y$, $y(1) = -\ln \dfrac{5}{2}$

9) $\dfrac{dy}{dx} = \dfrac{5x^2}{e^{2y}}$, $y(1) = \dfrac{\ln \frac{10}{3}}{2}$

10) $\dfrac{dy}{dx} = \dfrac{2y^2}{x}$, $y(1) = 1$

11) $\dfrac{dy}{dx} = -\dfrac{x}{y}$, $y(1) = -1$

12) $\dfrac{dy}{dx} = \dfrac{y+2}{x}$, $y(-2) = 0$

13) $\dfrac{dy}{dx} = \dfrac{x^2+3}{2y}$, $y(1) = -\dfrac{\sqrt{30}}{3}$

14) $\dfrac{dy}{dx} = -\dfrac{3yx}{\ln y}$, $y(0) = \dfrac{1}{e}$

15) $\dfrac{dy}{dx} = \dfrac{y+2}{x^2}$, $y(3) = \dfrac{-2e + 3\sqrt[3]{e^2}}{e}$

16) $\dfrac{dy}{dx} = \dfrac{3y}{x^2}$, $y(1) = \dfrac{3}{e^3}$

Calculus Practice: Differential Equations 1b

For each problem, find the particular solution of the differential equation that satisfies the initial condition.

1) $\dfrac{dy}{dx} = \dfrac{2x}{e^y}$, $y(2) = 0$

$e^y = x^2 - 3$

$y = \ln(x^2 - 3)$, $x > \sqrt{3}$

2) $\dfrac{dy}{dx} = \dfrac{3e^x}{y^2}$, $y(0) = \sqrt[3]{7}$

$\dfrac{y^3}{3} = 3e^x - \dfrac{2}{3}$

$y = \sqrt[3]{9e^x - 2}$, $x > \ln\dfrac{2}{9}$

3) $\dfrac{dy}{dx} = \dfrac{2x}{e^{2y}}$, $y(-3) = \dfrac{\ln 16}{2}$

$\dfrac{e^{2y}}{2} = x^2 - 1$

$y = \dfrac{\ln(2x^2 - 2)}{2}$, $x < -1$

4) $\dfrac{dy}{dx} = \dfrac{2x^2}{y^2}$, $y(2) = \sqrt[3]{15}$

$\dfrac{y^3}{3} = \dfrac{2x^3}{3} - \dfrac{1}{3}$

$y = \sqrt[3]{2x^3 - 1}$, $x > \dfrac{\sqrt[3]{4}}{2}$

5) $\dfrac{dy}{dx} = 2y^2$, $y(-3) = \dfrac{1}{8}$

$-\dfrac{1}{y} = 2x - 2$

$y = -\dfrac{1}{2x - 2}$, $x < 1$

6) $\dfrac{dy}{dx} = \dfrac{-3 + x^2}{y^2}$, $y(-2) = \sqrt[3]{10}$

$\dfrac{y^3}{3} = -3x + \dfrac{x^3}{3}$

$y = \sqrt[3]{x^3 - 9x}$, $-3 < x < 0$

7) $\dfrac{dy}{dx} = 2x\sqrt{y}$, $y > 0$, $y(3) = \dfrac{9}{4}$

$2\sqrt{y} = x^2 - 6$

$y = \left(\dfrac{x^2}{2} - 3\right)^2$, $x > \sqrt{6}$

8) $\dfrac{dy}{dx} = xe^y$, $y(1) = -\ln\dfrac{5}{2}$

$-e^{-y} = \dfrac{x^2}{2} - 3$

$y = -\ln\left(-\dfrac{x^2}{2} + 3\right)$, $-\sqrt{6} < x < \sqrt{6}$

9) $\dfrac{dy}{dx} = \dfrac{5x^2}{e^{2y}}$, $y(1) = \dfrac{\ln \dfrac{10}{3}}{2}$

$\dfrac{e^{2y}}{2} = \dfrac{5x^3}{3}$

$y = \dfrac{\ln \dfrac{10x^3}{3}}{2}$, $x > 0$

10) $\dfrac{dy}{dx} = \dfrac{2y^2}{x}$, $y(1) = 1$

$-\dfrac{1}{2y} = \ln |x| - \dfrac{1}{2}$

$y = -\dfrac{1}{2\ln |x| - 1}$, $0 < x < \sqrt{e}$

11) $\dfrac{dy}{dx} = -\dfrac{x}{y}$, $y(1) = -1$

$\dfrac{y^2}{2} = -\dfrac{x^2}{2} + 1$

$y = -\sqrt{-x^2 + 2}$, $-\sqrt{2} < x < \sqrt{2}$

12) $\dfrac{dy}{dx} = \dfrac{y+2}{x}$, $y(-2) = 0$

$\ln |y+2| = \ln |x|$
$y = -x - 2$, $x < 0$

13) $\dfrac{dy}{dx} = \dfrac{x^2+3}{2y}$, $y(1) = -\dfrac{\sqrt{30}}{3}$

$y^2 = \dfrac{x^3}{3} + 3x$

$y = -\sqrt{\dfrac{x^3}{3} + 3x}$, $x > 0$

14) $\dfrac{dy}{dx} = -\dfrac{3yx}{\ln y}$, $y(0) = \dfrac{1}{e}$

$\dfrac{(\ln y)^2}{2} = -\dfrac{3x^2}{2} + \dfrac{1}{2}$

$y = e^{-\sqrt{-3x^2+1}}$, $-\dfrac{\sqrt{3}}{3} < x < \dfrac{\sqrt{3}}{3}$

15) $\dfrac{dy}{dx} = \dfrac{y+2}{x^2}$, $y(3) = \dfrac{-2e + 3\sqrt[3]{e^2}}{e}$

$\ln |y+2| = -\dfrac{1}{x} + \dfrac{3\ln 3 + 1}{3}$

$y = 3e^{-\frac{1}{x}} - 2$, $x > 0$

16) $\dfrac{dy}{dx} = \dfrac{3y}{x^2}$, $y(1) = \dfrac{3}{e^3}$

$\dfrac{\ln |y|}{3} = -\dfrac{1}{x} + \dfrac{3 + \ln 3}{3}$

$y = 3e^{-\frac{3}{x}}$, $x > 0$