AP Calculus Name_____

Separable Differential Equations Practice

Date_____ Period____

Find the general solution of each differential equation.

1) $\frac{dy}{dx} = \frac{x^3}{y^2}$

2) $\frac{dy}{dx} = \frac{1}{\sec^2 y}$

3) $\frac{dy}{dx} = 3e^{x-y}$

4) $\frac{dy}{dx} = \frac{2x}{e^{2y}}$

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

5) $\frac{dy}{dx} = \frac{2x}{y^2},\ y(2) = \sqrt[3]{13}$

6) $\frac{dy}{dx} = 2e^{x-y},\ y(-3) = \ln \frac{3e^3 + 2}{e^3}$

7) $\frac{dy}{dx} = \frac{1}{\sec^2 y},\ y(3) = 0$

8) $\frac{dy}{dx} = \frac{e^x}{y^2},\ y(-1) = \frac{\sqrt[3]{e^3 + 3e^2}}{e}$

9) $\frac{dy}{dx} = -\frac{1}{\sin y},\ y(3) = \frac{\pi}{2}$

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

11) $\frac{dy}{dx} = \frac{3x^2}{e^{2y}},\ y(1) = 0$

12) $\frac{dy}{dx} = \frac{1 + x^2}{y^2},\ y(-1) = -\sqrt[3]{4}$

Answers to Separable Differential Equations Practice

1) $\frac{y^3}{3} = \frac{x^4}{4} + C_1$

$y = \sqrt[3]{\frac{3x^4}{4} + C}$

2) $\tan y = x + C$

$y = \tan^{-1}(x + C)$

3) $e^y = 3e^x + C$

$y = \ln(3e^x + C)$

4) $\frac{e^{2y}}{2} = x^2 + C_1$

$y = \frac{\ln(2x^2 + C)}{2}$

5) $\frac{y^3}{3} = x^2 + \frac{1}{3}$

$y = \sqrt[3]{3x^2 + 1}$

6) $e^y = 2e^x + 3$

$y = \ln(2e^x + 3)$

7) $\tan y = x - 3$

$y = \tan^{-1}(x - 3)$

8) $\frac{y^3}{3} = e^x + \frac{1}{3}$

$y = \sqrt[3]{3e^x + 1}$

9) $\cos y = x - 3$

$y = \cos^{-1}(x - 3), 2 < x < 4$

10) $\frac{e^{2y}}{2} = x^2 - \frac{3}{2}$

$y = \frac{\ln(2x^2 - 3)}{2}, x > \frac{\sqrt{6}}{2}$

11) $\frac{e^{2y}}{2} = x^3 - \frac{1}{2}$

$y = \frac{\ln(2x^3 - 1)}{2}, x > \frac{\sqrt[3]{4}}{2}$

12) $\frac{y^3}{3} = x + \frac{x^3}{3}$

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