SATPREP

Name____________________

Assignment: Differential Equation

Date__________

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

1) $\frac{dy}{dx} = 2x - 1,\ y(1) = 0$

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

Find the general solution of each differential equation.

3) $\frac{dy}{dx} = -\cos x$

4) $\frac{dy}{dx} = -\frac{1}{x - 2}$

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

5) $\frac{dy}{dx} = \frac{2y^2}{x},\ y(1) = 1$

6) $\frac{dy}{dx} = xy^2,\ y(3) = -\frac{2}{11}$

7) $\frac{dy}{dx} = \frac{y + 3}{x},\ y(-3) = 0$

8) $\frac{dy}{dx} = \frac{2e^x}{y^2},\ y(1) = \sqrt[3]{6e - 1}$

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

10) $\frac{dy}{dx} = \frac{x}{y^2},\ y(1) = \frac{\sqrt[3]{28}}{2}$

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

12) $\frac{dy}{dx} = \frac{y+1}{x},\ y(-2) = -3$

13) $\frac{dy}{dx} = \frac{2 + x^2}{y^2},\ y(-1) = -\sqrt[3]{7}$

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

Answers to Assignment: Differential Equation

1) $y = x^2 - x$

2) $y = 3\ln -x - 3,\ x < 0$

3) $y = -\sin x + C$

4) $y = -\ln\left(-x + 2\right) + C$

5) $-\dfrac{1}{2y} = \ln\left|x\right| - \dfrac{1}{2}$

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

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

$$y = -\frac{2}{x^2 + 2}$$

7) $\ln\left|y + 3\right| = \ln\left|x\right|$

$$y = -x - 3,\ x < 0$$

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

$$y = \sqrt[3]{6e^x - 1},\ x > \ln\frac{1}{6}$$

9) $\dfrac{y^3}{3} = e^x + C_1,\ C_1 = \dfrac{2}{3}$

$$y = \sqrt[3]{3e^x + C},\ C = 2$$

10) $\dfrac{y^3}{3} = \dfrac{x^2}{2} + C_1,\ C_1 = \dfrac{2}{3}$

$$y = \sqrt[3]{\frac{3x^2}{2} + C},\ C = 2$$

11) $\dfrac{(\ln y)^2}{2} = -\dfrac{3x^2}{2} + C_1,\ C_1 = \dfrac{1}{2}$

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

12) $\ln\left|y + 1\right| = \ln\left|x\right| + C_1,\ C_1 = 0$

$$y = -Cx - 1,\ x < 0,\ C = -1$$

13) $\dfrac{y^3}{3} = 2x + \dfrac{x^3}{3} + C,\ C = 0$

$$y = \sqrt[3]{x^3 + 6x + C},\ x < 0,\ C = 0$$

14) $-\dfrac{1}{y} = 2x + C,\ C = 1$

$$y = -\frac{1}{2x + C},\ x < -\frac{C}{2},\ C = 1$$