

WORKSHEET ON DIFFERENTIAL EQUATIONS

Work the following on notebook paper. Do not use your calculator.

Solve the initial value problem by separation of variables.

1. $\frac{dy}{dx} = \frac{x^2}{y}$ given $y = -5$ and $x = 3$

2. $\frac{dy}{dx} = 6x^2y$ and $y(0) = 4$

3. $\frac{dy}{dx} = \frac{1}{y^2}$ and $y(0) = 4$

4. $\frac{dy}{dx} = \frac{1+x}{\sqrt{y}}$ and $y(2) = 9$

5. $\frac{dy}{dx} = -xy^2$ and $y(1) = -0.25$

6. $\frac{dy}{dx} = \frac{4\sqrt{y} \ln x}{x}$ and $y(e) = 9$

7. Find an equation of the curve that satisfies $\frac{dy}{dx} = 4x^3y$ and whose y -intercept is $(0, 7)$.

8. Find an equation of the curve that passes through the point $(1, 1)$ and whose slope at (x, y) is $\frac{y^2}{x^3}$.

9. If $\frac{dy}{dt} = -3y$ and if $y = 1$ when $t = 0$, what is the value of t for which $y = \frac{1}{3}$?

10. If $\frac{dy}{dx} = y \cos x$ and $y = 3$ when $x = 0$, then $y = ?$

11. If $f'(x) = 2f(x)$ and $f(2) = 1$, then $f(x) = ?$

Multiple Choice

12. If $\frac{dy}{dx} = 2y^2$ and if $y = -1$ when $x = 1$, then when $x = 2$, $y =$

- (A) $-\frac{2}{3}$ (B) $-\frac{1}{3}$ (C) 0 (D) $\frac{1}{3}$ (E) $\frac{2}{3}$

13. If $\frac{dy}{dx} = x^2y$, then y could be

- (A) $3 \ln\left(\frac{x}{3}\right)$ (B) $e^{\frac{x^3}{3}} + 7$ (C) $2e^{\frac{x^3}{3}}$ (D) $3e^{2x}$ (E) $\frac{x^3}{3} + 1$

Write and solve the differential equation that models the given verbal statement.

14. The rate of change of N with respect to s is proportional to $250 - N$.

15. The rate of change of R with respect to t is inversely proportional to the square root of R .

16. The rate of change of y with respect to x varies jointly with x and $L - y$.