

1. Is $y = \sin^2(x^2)$ a solution to the differential equation $y' = 4x \cdot \cos(x^2) \cdot y$? Explain why your answer is correct.
2. Here are ten differential equations. Some of them are separable, and some are not. For now, you do *not* have to solve any of them. For each one, classify it as separable or inseparable. If it is separable, separate it.

1. $y' = \frac{x}{\sqrt{y}}$

2. $y' = x + y$

3. $y' = \ln(xy)$

4. $y' = \frac{\ln x + x}{\ln y + y}$

5. $y' = ye^{\sin x + \cos y}$

6. $y' = \ln(x^y)$

7. $y' = \sin(x^y)$

8. $y' = y \sin x + xy$

9. $y' = \frac{xy + y}{2x - 3xy}$

10. $y' = xy - 2x + y - 2$

Good work. Now go back and start solving some of the separable DEs.

3. Consider the sequence $\left\{ \frac{n!}{n^n} \right\}_{n=1}^{\infty}$. Explain to our inquisitive 8th grade girl why this sequence converges.