

Each of the following equations contains a mistake. Spot the mistake and explain why it is wrong.

1. $\frac{3}{x} + \frac{x+2}{x^2} = \frac{3+x+2}{x+x^2}$

2. $\sin^{-1} x = \frac{1}{\sin x}$

3. $\sin(2x+3) = \sin 2x + \sin 3$

4. $(x+3)^2 = x^2 + 9$

5. $\frac{\log_2 x}{\log_2 5} = \log_2 x - \log_2 5$

6. $\tan \theta = \frac{\sin}{\cos} \theta$

7. $e^{x+2} = e^x + e^2$

8. $\tan(x^2) = \tan^2 x$

9. $\frac{x^2+x+3}{x+4} = \frac{x^2+3}{4}$

10. $\frac{\sin x}{\sin y} = \frac{x}{y}$

11. $e^x e^2 = e^{2x}$

12. If $\sin x = \frac{1}{2}$, then $\sin^{-1} x = 2$.