

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

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

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

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

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

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

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

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

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

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

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

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

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