

$$f(x) = 2A \cdot \sin(kx)$$

$$\hat{A} = \frac{3}{k} \cdot \frac{d^2}{dx^2}$$

$$\frac{3}{k} \cdot \frac{d^2}{dx^2} (2A \cdot \sin(kx)) = J \cdot 2A \cdot \sin(kx)$$

$$\frac{3}{k} \cdot \frac{d}{dx} (2A \cdot k \cdot \cos(kx)) = J \cdot 2A \cdot \sin(kx)$$

$$\frac{3}{k} \cdot 2A \cdot k^2 (-\sin(kx)) = J \cdot 2A \cdot \sin(kx)$$

$$\cancel{\frac{3}{k}} \cdot \cancel{2A} \cdot k \cdot \cancel{\sin(kx)} = J \cdot \cancel{2A} \cdot \cancel{\sin(kx)}$$

$$\boxed{-3k = J}$$