

Fenix - Differential equations 1

(α) Find all real valued functions $f(x)$ satisfying

(a) $f'(x) = \sin(2x)$

(b) $f'(x) = \cos(3x)$

(c) $f'(x) = 1$

(d) $f'(x) = x$

(e) $f'(x) = \sin(x) + \cos(x) + x + 1$

(f) $f'(x) = \exp(5x)$

(β) Find all real valued functions $f(x)$ satisfying

(a) $f'(x) = f(x)$

(b) $f'(x) = 2f(x)$

(c) $f'(x) = f(x) + 1$

(d) $f'(x) = f(x) + x$

(e) $f'(x) = f(x) + \sin(x)$

(f) $f'(x) = 2f(x) + x^2$

(γ) A block of copper was heated to 200C° cools down according to Newton's law of cooling with convective heat transfer coefficient equal to $10\text{W}/(\text{m}^2\text{K})$. Find temperature of the block after 10 minutes.

(δ) Show that only a parabolic mirror can focus parallel rays of light into a single point.