

(1) [3] Differentiate $y = t^3 - \frac{1}{\sqrt[3]{t^4}} = t^3 - t^{-\frac{4}{3}}$

$$y' = 3t^2 + \frac{4}{3}t^{-\frac{7}{3}}$$

(2) [3] Determine an equation of the tangent line to $y = x + \sqrt{x}$ at the point (1, 2).

$$y' = 1 + \frac{1}{2}x^{-\frac{1}{2}}$$

$$y' \Big|_{x=1} = 1 + \frac{1}{2} = \frac{3}{2}$$

$$\therefore y - 2 = \frac{3}{2}(x - 1)$$

(3) [3] Differentiate $g(x) = x^3 \sin(x)$

$$g'(x) = 3x^2 \sin(x) + x^3 \cos(x)$$

(4) [3] Differentiate $y = \frac{x^2}{\cos(x)}$

$$y' = \frac{\cos(x)(2x) - x^2(-\sin(x))}{\cos^2(x)}$$

$$y' = \frac{2x \cos(x) + x^2 \sin(x)}{\cos^2(x)}$$

(5) [3] Differentiate $f(\theta) = \frac{\sec(\theta)}{1 + \sec(\theta)}$

$$f'(\theta) = \frac{[1 + \sec(\theta)][\sec(\theta) \tan(\theta)] - \sec(\theta)[\sec(\theta) \tan(\theta)]}{[1 + \sec(\theta)]^2}$$

$$= \frac{\sec(\theta) \tan(\theta)}{[1 + \sec(\theta)]^2}$$