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

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

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

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

(2) [3] Differentiate $y = t^4 - \frac{1}{\sqrt[4]{t^3}}$ $= t^4 - t^{-\frac{3}{4}}$

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

(3) [3] Differentiate $y = \dfrac{x^2}{\sin(x)}$

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

(4) [3] Differentiate $g(x) = x^3\cos(x)$

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

$$= 3x^2\cos(x) - x^3\sin(x)$$

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

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

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