(1) [3] Differentiate

$$g(t) = \frac{1}{(t^4+1)^3} = (t^4+1)^{-3}$$

$$g'(t) = -3(t^4+1)^{-4}(4t^3)$$

$$= -12t^3(t^4+1)^{-4}$$

(2) [4] Differentiate

$$y = (2x-5)^4(8x^2-5)^{-3}$$

$$y' = 4(2x-5)^3(2)(8x^2-5)^{-3} + (2x-5)^4(-3)(8x^2-5)^{-4}(16x)$$

OR

$$= \frac{8(2x-5)^3}{(8x^2-5)^3} - \frac{48x(2x-5)^4}{(8x^2-5)^4}$$

(3) [4] Differentiate

$$y = \frac{r}{\sqrt{r^2+1}} = \frac{r}{(r^2+1)^{1/2}}$$

$$y' = \frac{(r^2+1)^{\frac{1}{2}} - r\left(\frac{1}{2}\right)(r^2+1)^{-\frac{1}{2}}(2r)}{\left[(r^2+1)^{1/2}\right]^2}$$

or

$$= \frac{(r^2+1)^{\frac{1}{2}} - r^2(r^2+1)^{-\frac{1}{2}}}{r^2+1} \cdot \frac{(r^2+1)^{\frac{1}{2}}}{(r^2+1)^{\frac{1}{2}}}$$

$$= \frac{1}{(r^2+1)^{3/2}}$$

(4) [4] Differentiate

$$y = \sin\left(\tan\left(\sqrt{\sin x}\right)\right)$$

$$y' = \cos\left(\tan\left((\sin x)^{\frac{1}{2}}\right)\right) \cdot \sec^2\left((\sin x)^{\frac{1}{2}}\right) \cdot \frac{1}{2}(\sin x)^{-\frac{1}{2}} \cdot \cos x$$