$$f(x) = \frac{x^{\frac{1}{3}} - 4}{x^{7/2}} \qquad \left(\frac{f}{g}\right)' = \frac{f'g - g'f}{g^2}$$

$$f'(x) = \frac{\frac{d}{dx}\left(x^{1/3} - 4\right)\left(x^{7/2}\right) - \boxed{\frac{d}{dx}}\left(x^{7/2}\right)\left(x^{1/3} - 4\right)}{x^7}$$

$$\boxed{f'(x) = \frac{\left(\frac{1}{3}x^{-2/3}\right)\left(x^{7/2}\right) - \left(\frac{7}{2}x^{5/2}\right)\left(x^{1/3} - 4\right)}{x^7}}$$

$$f(x) = 4^{\sin^2(x) + \cos(3x)}$$

$$f'(x) = 4^{\sin^2(x) + \cos(3x)} \cdot \ln(4) \cdot \frac{d}{dx}\left(\sin^2 x + \cos(3x)\right)$$

$$\rightarrow \frac{d}{dx}\left[(\sin(x))^2 + \cos(3\underline{x})\right]$$

$$2(\sin(x)) \cdot \cos x + (-\sin(3x)) \cdot 3$$

$$\boxed{f'(x) = 4^{\sin^2(x) + \cos(3x)} \cdot \ln(4) \cdot (2\sin x \cos x - 3\sin 3x)}$$

✓

$(0, 2\pi)$

$$f(x) = 1 - \frac{\tan(x)}{\sec(x)}$$

$$\frac{\frac{\sin(x)}{\cos(x)}}{\frac{1}{\cos x}} = \frac{\sin(x)}{\cancel{\cos(x)}} \cdot \frac{\cancel{\cos(x)}}{1} = \sin(x)$$

$\rightarrow f(x) = 1 - \sin x$

$f'(x) = -\cos(x) = 0 \rightarrow \cos(x) = 0$

$$\boxed{x = \frac{\pi}{2}, \frac{3\pi}{2}}$$

$$f(x) = \csc^2(\tan(3x^2))$$

$$f(x) = \left(\csc(\tan(3x^2))\right)^2$$

$$f'(x) = 2\left(\csc(\tan(3x^2))\right) \cdot \frac{d}{dx}\left[\csc(\tan(3x^2))\right]$$

$$-\csc(\tan(3x^2))\cot(\tan(3x^2)) \cdot \frac{d}{dx}(\tan(3x^2))$$

$$\sec^2(3x^2) \cdot \frac{d}{dx}(3x^2)$$

$$= 6x$$

$$\boxed{f'(x) = 2\csc(\tan(3x^2)) \cdot (-\csc(\tan(3x^2))\cot(\tan(3x^2))) \cdot \sec^2(3x^2) \cdot 6x}$$