

Quiz 4, Sep 27th, 2012

Write your answers on this page. Continue on the back if you need more space.

(5 pts) 1. Find the derivative of the following function and simplify your answer:

$$f(x) = \frac{1}{x^2+2} - \sin^2 x = \frac{1}{x^2+2} - (\sin x)(\sin x)$$

$$f'(x) = \frac{(x^2+2)(0) - (1)(2x)}{(x^2+2)^2} - (\sin x \cos x + \sin x \cos x) \quad (\text{using quotient + product rules})$$

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

(Alternately, using chain rules:

$$f(x) = (x^2+2)^{-1} - (\sin x)^2$$

$$f'(x) = -(x^2+2)^{-2}(2x) - 2(\sin x)^1 \cos x$$

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

(5 pts) 2. Find the derivative of the following function by using the quotient rule and simplify your answer

$$f(x) = \frac{\sqrt{x}-x}{\sqrt{x}+x}$$

$$\frac{d}{dx}(\sqrt{x}) = \frac{d}{dx}(x^{1/2}) = \frac{1}{2}x^{-1/2} = \frac{1}{2} \cdot \frac{1}{\sqrt{x}}$$

$$f'(x) = \frac{(\sqrt{x}+x)(\frac{1}{2} \cdot \frac{1}{\sqrt{x}} - 1) - (\sqrt{x}-x)(\frac{1}{2} \frac{1}{\sqrt{x}} + 1)}{(\sqrt{x}+x)^2}$$

$$= \frac{(\frac{1}{2} - \sqrt{x}) + \frac{1}{2} \sqrt{x} - x}{(\sqrt{x}+x)^2} - \frac{(\frac{1}{2} + \sqrt{x}) - \frac{1}{2} \sqrt{x} - x}{(\sqrt{x}+x)^2}$$

$$= \frac{-2\sqrt{x} + \sqrt{x}}{(\sqrt{x}+x)^2}$$

$$= \frac{-\sqrt{x}}{(\sqrt{x}+x)^2}$$

