

$$1. \quad f(x) = 7 \cos x - 3 \tan x$$

$$f'(x) = -7 \sin x - 3 \sec^2 x$$

$$2. \quad f(x) = \cos 7x - \tan 3x$$

$$f'(x) = -7 \sin 7x - 3 \sec^2 3x$$

$$3. \quad f(x) = x^4 \sin x$$

$$f'(x) = x^4 \cos x + 4x^3 \sin x$$

$$4. \quad f(x) = \frac{\tan x}{\sec x}$$

$$f'(x) = \frac{\sec x \cdot \sec^2 x - \tan x \cdot \sec x \tan x}{\sec^2 x}$$

$$= \frac{\sec^2 x - \tan^2 x}{\sec x} = \frac{1}{\sec x} = \cos x$$

There was also a much easier way to do this:

$$f(x) = \frac{\tan x}{\sec x} = \frac{\frac{\sin x}{\cos x}}{\frac{1}{\cos x}} = \sin x, \quad \text{so} \quad f'(x) = \cos x$$

$$5. \quad f(x) = \cos(3x^2 - 1)$$

$$f'(x) = -6x \sin(3x^2 - 1)$$

$$6. \quad f(x) = \sqrt{\tan x}. \quad \text{Rewrite } f(x) = (\tan x)^{\frac{1}{2}}$$

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

$$7. \quad f(x) = \left(\frac{x+1}{x-1} \right)^5$$

$$f'(x) = 5 \left(\frac{x+1}{x-1} \right)^4 \cdot \frac{d}{dx} \left(\frac{x+1}{x-1} \right)$$

$$= 5 \left(\frac{x+1}{x-1} \right)^4 \cdot \frac{(x-1) \cdot 1 - (x+1) \cdot 1}{(x-1)^2}$$

$$= 5 \left(\frac{x+1}{x-1} \right)^4 \cdot \frac{-2}{(x-1)^2}$$

$$= -10 \frac{(x+1)^4}{(x-1)^6}$$

$$8. \quad f(x) = \sin(x^2) \cos\left(\frac{1}{x}\right)$$

$$f'(x) = \frac{d}{dx} (\sin(x^2)) \cos\left(\frac{1}{x}\right) + \sin(x^2) \frac{d}{dx} \left(\cos\left(\frac{1}{x}\right) \right)$$

$$= 2x \cos(x^2) \cos\left(\frac{1}{x}\right) + \frac{1}{x^2} \sin(x^2) \sin\left(\frac{1}{x}\right)$$

Some comments: I had already made the midterm before I made this quiz, but to make the quiz, I looked closely at your homework, not at the midterm I had made. So there is no reason to assume that the questions on the midterm will match the ones here. However, the midterm is testing, among other things, differentiating trig functions and using rules like chain rule and others, like on this quiz. If you feel comfortable enough with those rules to do these problems correctly, that is a good sign.