

Find the derivatives of the following functions:

1. (5 points)  $f(t) = \sin(t^2)$

**Solution:**

$$f'(t) = \cos(t^2) \cdot (2t) = 2t \cos(t^2)$$

2. (5 points)  $g(x) = \sqrt{x^3 - \tan x}$

**Solution:**

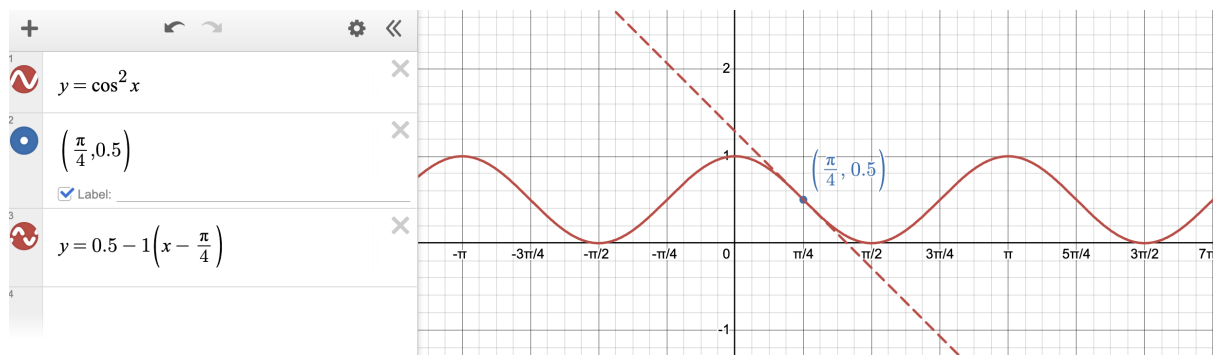
$$g'(x) = \frac{1}{2\sqrt{x^3 - \tan x}}(3x^2 - \sec^2 x) = \frac{3x^2 - \sec^2 x}{2\sqrt{x^3 - \tan x}}$$

3. (5 points)  $y = \cos^2(x)$

**Solution:**

$$\frac{dy}{dx} = 2 \cos x (-\sin x) = -2 \sin x \cos x$$

4. (5 points) Shown below is the graph of  $y = \cos^2(x)$ :



Sketch the tangent line to the curve at the point  $\left(\frac{\pi}{4}, \frac{1}{2}\right)$ , and then find the equation of that tangent line.

Hint: Use your solution to #3 to find the slope, using the fact that  $\sin\left(\frac{\pi}{4}\right) = \cos\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}$

**Solution:**

$$m = \frac{dy}{dx} = -2 \sin\left(\frac{\pi}{4}\right) \cos\left(\frac{\pi}{4}\right) = -2 \cdot \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{2}}{2} = -\frac{2}{2} = -1$$

$$y = \frac{1}{2} - 1\left(x - \frac{\pi}{4}\right)$$