

## Math 220 Quiz # 3 Solutions

1. Compute the derivative of

$$f(x) = (x^2 + 7x + 4) \tan x$$

Solution:

$$\begin{aligned} f'(x) &= (x^2 + 7x + 4)' \tan x + (x^2 + 7x + 4)(\tan x)' \\ &= (2x + 7) \tan x + (x^2 + 7x + 4) \sec^2 x \end{aligned}$$

2. Compute the derivative of

$$g(x) = \frac{7x^2 + 5}{x^2 + 6}$$

Solution:

$$\begin{aligned} g'(x) &= \frac{(x^2 + 6)(7x^2 + 5)' - (x^2 + 6)'(7x^2 + 5)}{(x^2 + 6)^2} \\ &= \frac{14x(x^2 + 6) - 2x(7x^2 + 5)}{(x^2 + 6)^2} \end{aligned}$$

3. Find the equation of the tangent line for

$$y = f(x) = \sqrt{x^2 + 99}$$

at  $x = 1$ .

Solution:

When  $x = 1$ , we have  $y = f(1) = \sqrt{1^2 + 99} = \sqrt{100} = 10$ . Thus the tangent passes through  $(1, 10)$ . To find the slope of the tangent, compute the derivative:

$$\begin{aligned} f'(x) &= ((x^2 + 99)^{1/2})' \\ &= \frac{1}{2}(x^2 + 99)^{-1/2}(x^2 + 99)' \quad \text{Chain Rule} \\ &= \frac{1}{2}(x^2 + 99)^{-1/2}2x \\ &= \frac{x}{\sqrt{x^2 + 99}} \end{aligned}$$

Thus  $m = f'(1) = 1/10$ . Therefore the equation of the tangent line is

$$y - 10 = \frac{1}{10}(x - 1)$$