

You're given $f(x) = \frac{2x + 1}{x + 2}$. You have to find the equation of the tangent line at (1,1)

1) Find the derivative using the quotient rule: $f'(x) = \frac{(x + 2) \cdot \frac{d}{dx}(2x + 1) - (2x + 1) \cdot \frac{d}{dx}(x + 2)}{(x + 2)^2}$

1a) take the derivatives $= \frac{(x + 2) \cdot (2) - (2x + 1)(1)}{(x + 2)^2}$

1b) distribute $= \frac{2x + 4 - 2x - 1}{(x + 2)^2}$

1c) simplify $= \frac{3}{(x + 2)^2}$

2) Evaluate this at $x=1$: $f'(1) = \frac{3}{(1 + 2)^2} = \frac{3}{3^2} = \frac{3}{3 \cdot 3} = \frac{1}{3} = \frac{1}{3}$

3) Write the equation of the tangent:

$$y - 1 = \frac{1}{3}(x - 1) \quad \text{setup}$$

$$y - 1 = \frac{1}{3}x - \frac{1}{3} \quad \text{distribute the } \frac{1}{3}$$

$$y = \frac{1}{3}x - \frac{1}{3} + 1 \quad \text{add 1 to both sides}$$

$$y = \frac{1}{3}x - \frac{1}{3} + \frac{3}{3} \quad \text{rewrite 1 as } \frac{3}{3}$$

$$y = \frac{1}{3}x + \frac{2}{3}$$