

$$12. y = \ln x^{\frac{3}{2}} \quad \left(e, \frac{3}{2} \right)$$

EQUATION OF TANGENT LINE

① FIND DERIVATIVE

$$y = \frac{3}{2} \ln x$$

$$y' = \frac{3}{2} \cdot \frac{1}{x}$$

$$y' = \frac{3}{2x}$$

② CHANGE y' TO m AND PLUG IN x PART OF POINT

$$m = \frac{3}{2e}$$

③ PLUG IN GIVEN POINT FOR x, y AND m FROM STEP ② INTO $y = mx + b$ AND SOLVE FOR b

$$y = mx + b$$

$$\frac{3}{2} = \frac{3}{2e}(e) + b$$

$$\frac{3}{2} = \frac{3}{2} + b$$

$$\frac{3}{2} - \frac{3}{2} = b$$

$$0 = b$$

④ WRITE ANSWER

$$y = mx + b$$

$$y = \frac{3}{2e}x + 0$$

$$\boxed{y = \frac{3}{2e}x}$$

$$13. y = \ln(x \sqrt[3]{x-2}) \quad \left(10, \ln 20 \right)$$

$$y = \ln x + \ln \sqrt[3]{x-2}$$

$$y = \ln x + \ln(x-2)^{\frac{1}{3}}$$

$$y = \ln x + \frac{1}{3} \ln(x-2)$$

$$y' = \frac{1}{x} + \frac{1}{3} \cdot \frac{1}{x-2} \cdot \frac{d}{dx}(x-2)$$

$$y' = \frac{1}{x} + \frac{1}{3(x-2)}$$

$$m = \frac{1}{10} + \frac{1}{3(10-2)}$$

$$m = \frac{1}{10} + \frac{1}{24}$$

$$m = \frac{12}{120} + \frac{5}{120}$$

$$m = \frac{17}{120}$$

so

$$y = mx + b$$

$$\ln 20 = \frac{17}{120}(10) + b$$

$$\ln 20 = \frac{17}{12} + b$$

$$\ln 20 - \frac{17}{12} = b$$

$$y = mx + b$$

$$\boxed{y = \frac{17}{120}x + \ln 20 - \frac{17}{12}}$$