

c) $f(x) = \log(\operatorname{cosec}(x) - \cot(x))$ show $f'(x) = \operatorname{cosec}(x)$

show that $\frac{d}{dx}(\log(\operatorname{cosec}(x) - \cot(x))) = \operatorname{cosec}(x)$

$$\frac{d}{dx} \log(\operatorname{cosec}(x) - \cot(x)) = \frac{\frac{d}{du} \log(u)}{\frac{du}{dx}} \left[u = \operatorname{cosec}(x) - \cot(x) \right]$$

$$\left[\frac{d}{du} \log(u) = \frac{1}{u} \right]$$

$$\frac{\frac{d}{dx}(\operatorname{cosec}(x) - \cot(x))}{\operatorname{cosec}(x) - \cot(x)} = \frac{\left(-\frac{d}{dx}(\cot(x))\right) + \frac{d}{dx}(\operatorname{cosec}(x))}{\operatorname{cosec}(x) - \cot(x)}$$

$$\left[\begin{array}{l} u = x \\ \frac{d}{du} f(\cot(u)) = -\operatorname{cosec}^2(u) \end{array} \right]$$

$$\frac{\operatorname{cosec}^2(x) \left(\frac{d}{dx}(x)\right) + \frac{d}{dx}(\operatorname{cosec}(x))}{-\cot(x) + \operatorname{cosec}(x)}$$

$$\frac{\operatorname{cosec}^2(x) + \frac{d}{dx}(\operatorname{cosec}(x))}{-\cot(x) + \operatorname{cosec}(x)}$$

$$\operatorname{cosec}(x)$$

!! it worked!

Simplify to