

Name _____

SHOW AS MUCH WORK AS POSSIBLE BECAUSE YOU MAY RECEIVE PARTIAL CREDIT FOR THE WORK YOU DO IF YOUR ANSWER IS INCORRECT.

1. Set up (**but don't solve**) the derivative of $f(x) = \frac{1}{x^2}$ using **both** of the derivative definitions. (DON'T USE THE POWER RULE.)

$$f'(x) = \lim_{x \rightarrow a} \frac{\frac{1}{x^2} - \frac{1}{a^2}}{x - a}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{\frac{1}{(x+h)^2} - \frac{1}{x^2}}{h}$$

2. Find and simplify y' where $y = x^2 - 2x^2 \ln x$.

$$y = x^2 - 2x^2 \ln x$$

$$y' = 2x - 2 \cdot D_x(x^2 \ln x)$$

$$D_x(x^2 \ln x) = (2x) \cdot \ln x + x^2 \cdot \left(\frac{1}{x}\right) = 2x \ln x + x$$

$$y' = 2x - 2 \cdot (2x \ln x + x)$$

$$y' = 2x - 4x \ln x - 2x$$

$$y' = -4x \ln x$$