Name: _____

Note: When transforming expressions into equivalent forms, write a chain of equalities. Don't just write one expression after the next without stating the relationship between the expressions.

When solving equations, write down one equation after another. Do not cross out or write on top of an equation.

1. Let $f(x) = 1 + x^2 \ln x + \frac{1}{x}$. Compute $f'(x)$, simplifying your answers as much as possible.

Solution:

$$f'(x) = 2x \ln x + x^2 \frac{1}{x} - \frac{1}{x^2} = 2x \ln x + x - \frac{1}{x^2}$$

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2. Let $f(t) = e^{-3t} + 2t$. Find the critical points of f (i.e., find the t-values for which $f'(t) = 0$).

Solution: First, we find

$$f'(t) = -3e^{-3t} + 2.$$

Now we set this equal to 0 and solve for t:

$$-3e^{-3t} + 2 = 0$$
$$2 = 3e^{-3t}$$
$$\frac{2}{3} = e^{-3t}$$
$$\ln\left(\tfrac{2}{3}\right) = -3t$$
$$t = -\tfrac{1}{3}\ln\left(\tfrac{2}{3}\right) = \tfrac{1}{3}\ln\left(\tfrac{3}{2}\right)$$