

Each problem is worth 0 points... this time...

1. Show why the derivative of $\ln x$ is what it is.
(Research first if you need, but run your attempt by Jon for feedback!)
Fall 2021 Exam 3 #5 is a great place to look.
2. Let $f(x) = x \ln x - x$. Find $f'(x)$ in the most simplified form you can manage.
 $f'(x) = \ln x$.
3. Let $f(x) = \ln(x + \sqrt{9 + x^2})$. Find $f'(x)$ in the most simplified form you can manage.
 $\frac{1}{\sqrt{9+x^2}}$
4. Let $f(x) = \ln(\sin x)$. Find $f'(x)$ in the most simplified form you can manage.
 $f'(x) = \frac{\cos x}{\sin x} = \cot x$
5. Find a function of the form $f(x) = Ab^x$ passing through the points (1, 20) and (2, 25).
 $f(x) = 16 \cdot \left(\frac{5}{4}\right)^x$
6. (a) Find a function of the form $f(x) = Ab^x$ passing through the points (0, 361) and (10, 439).
 $f(x) = 361 \cdot \left(\frac{439}{361}\right)^x$ or $f(x) \approx 361 \cdot 1.019754738^x$
(b) Use your function from part (a) to find $f(20)$. Compare your result with the data in #6 of §3.4. ≈ 533.8531852 , so not bad compared to 548.
7. [Stewart] A sample of tritium-3 decayed to 94.5% of its original amount after a year.
(a) What is the half-life of tritium-3? $\ln(0.5)/\ln(0.945) \approx 12.25283496$
(b) How long would it take the sample to decay to 20% of its original amount?
 $\ln(0.2)/\ln(0.945) \approx 28.45020174$
8. [Stewart] A freshly brewed cup of coffee has temperature 95°C in a 20°C room. When its temperature is 70°C , it is cooling at a rate of 1°C per minute. When does this occur? after ≈ 20.27 minutes