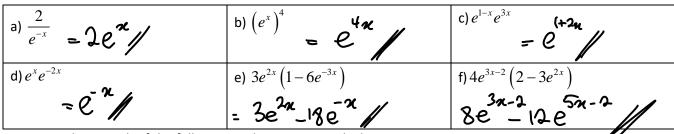
Name: Malyor Picayesh

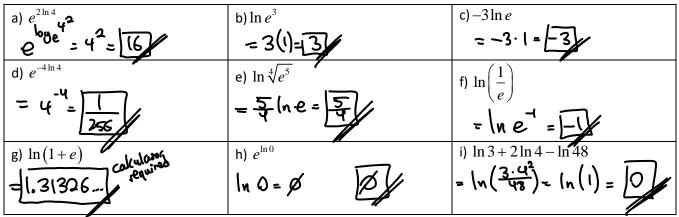
Date: April 5th, 2024

Math 12 Honours: section 5.6 Natural Logarithms and e

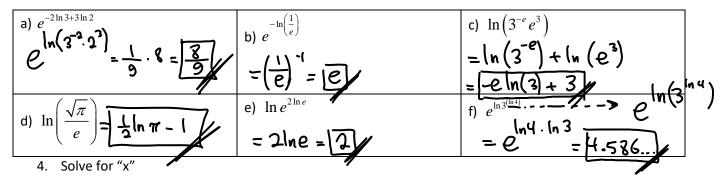
1. Simplify each of the following into a single exponent:

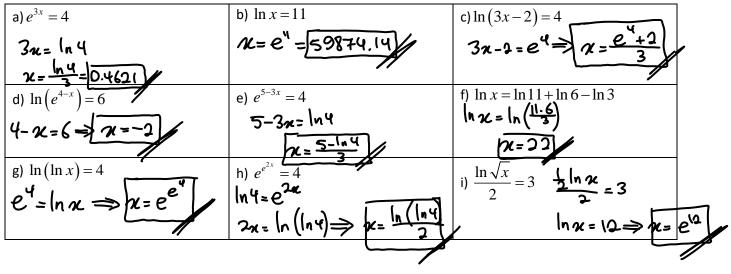


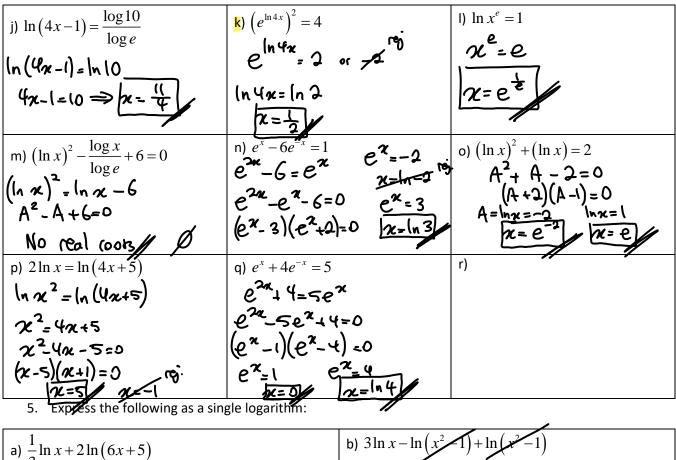
2. Evaluate each of the following without using a calculator

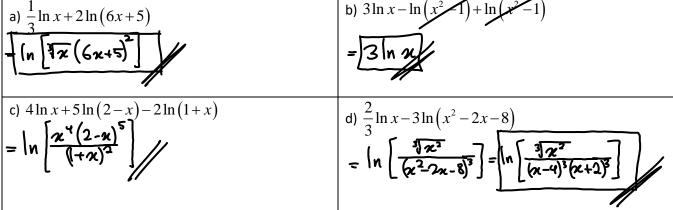


3. Reduct the following to lowest term









- 6. The relationsip between the elasped time "t", in hours, since Jack took his first do**se** of medication, and the amount of medication M(t), in mg, in his bloodstream is modelled by the following function below. $M(t) = 30 \times e^{-0.8t}$
 - I) How much medication will Jack have in his bloodstream after 3 hours?

$$M(3) = 30 e^{-0.3 \cdot 3} = 2.7215$$

II) How many hours will it take for Jack to have 1mg left in his bloodstream?

$$30e^{-0.3t} = 1 \implies -0.8t = \ln\left(\frac{1}{30}\right) \implies t = \frac{\ln\left(\frac{1}{30}\right)}{-0.8} = 4.25 \text{ hours}$$

7. The amount of money Dave has in his investment is given by the formula: $A = Pe^{rt}$. If He invests \$5000 at 2.5% interest, compounded continueously, how long will it take to double his investment?

8. A radio-active substance has a half life of 2500 years. What is the equation for the amount of this substance after "t" years in the form of
$$A = Pe^{n}$$
?

$$A = Pe^{\frac{1}{2}0002773}$$
9. TD bank offers an GIC that gives annual interest of 1.5% compounded monthly. What is the equivalent interest rate if the interest is compounded continuously?

$$A = P\left(\left(+\frac{0.015}{12}\right)^{1/2} = (-0)(5103556)^{1/2} = 0.0002773$$
9. TD bank offers an GIC that gives annual interest of 1.5% compounded monthly. What is the equivalent interest rate if the interest is compounded continuously?

$$A = P\left(\left(+\frac{0.015}{12}\right)^{1/2} = (-0)(5103556)^{1/2} = 0.0002773$$
10. Each year, Jason's parents contributes \$2500 into his RESP account, then govt will match it with \$500. Suppose the RESP is invested in a fund that gives 8% return annually, compounded continuously, starting when Jason was born, how much will he have in the account when he turns 18?

$$A = \left\{ \left(3000 e^{0.09} + 3000 \right) e^{0.09} + 3000 \right\} e^{0.09} + 3000 e^{0.09} + \cdots + 3000 e^{0$$

A=

$$e^{p} ? AMC 12B$$

$$D = \ln \left[4 \ln 2^{2} + \ln 3^{3} + \ln 4^{4} + \ln 5^{5} + \ln 6^{6} = \ln \left(2^{16} \cdot 3^{9} \cdot 5^{5} \right) \right]$$

12. Challenge: What is the value of
$$\lim_{xy \to 1} \left(\frac{\ln x}{\ln y} + \frac{\ln y}{\ln x} \right) = ?$$

$$\mathcal{W}y = l \Rightarrow j = \frac{1}{\mathcal{H}}$$

$$\lim_{\mathcal{X}_{n}\to 1} \left[\frac{\ln \mathcal{X}}{\ln l - \ln \mathcal{X}} + \frac{\ln l - \ln \mathcal{X}}{\ln \mathcal{X}} \right] = \frac{\ln \mathcal{X}}{-\ln \mathcal{X}} + \frac{-\ln \mathcal{X}}{\ln \mathcal{X}} = \frac{1}{2}$$
13. Evaluate:
$$\sum_{n=2}^{\infty} \frac{1}{n(n-1)^{3}}$$
, given Euler's beautiful result that:
$$1 + \frac{1}{2^{2}} + \frac{1}{3^{2}} + \dots + \frac{1}{n^{2}} + \dots = \frac{\pi^{2}}{6}$$
 [Math Circles]