

Math 21A
 Kouba
 Challenge Discussion Sheet 9

1.) Evaluate the following limits by using one of the three limit definitions for e .

a.) $\lim_{n \rightarrow \infty} \left(1 + \frac{4}{n}\right)^{3n}$ b.) $\lim_{n \rightarrow \infty} \left(1 + \frac{3}{7n}\right)^n$ c.) $\lim_{n \rightarrow -\infty} \left(1 - \frac{2}{3n}\right)^{-4n}$

d.) $\lim_{n \rightarrow \infty} \left(\frac{n+3}{n-2}\right)^n$ e.) $\lim_{h \rightarrow 0} \left(1 - \frac{h}{2}\right)^{3/h}$

2.) Solve for x .

a.) $\ln(2x+3) - \ln(x+4) = 0$ b.) $\log(x) + \log(x-21) = 2$

c.) $e^{3x} + 2 \cdot e^x = 3 \cdot e^{2x}$ d.) $e^{3x} - 3 \cdot e^{2x} - 2 \cdot e^x + 6 = 0$

3.) Solve $f'(x) = 0$ and $f''(x) = 0$ for x and set up a sign chart for each.

a.) $f(x) = x \ln x$. b.) $f(x) = x e^{-x^2/2}$.

4.) Find $y' = \frac{dy}{dx}$. Do not simplify your answers.

a.) $y = \ln[x(x+1)(x+2)(x+3)(x+4)]$ b.) $y = (x+1)^{e^{\sin x}}$ c.) $x^x \cdot y^3 = x^{\ln y}$

5.) Consider the rectangle in the given sketch inscribed in the first quadrant below the graph of $y = e^{(-3/2)x}$. Determine the dimensions of the rectangle

- with maximum area.
- with minimum perimeter.
- with minimum diagonal. Use Newton's method to estimate the root of the derivative equation to three decimal places.

