

Math 21A
Vogler
Discussion Sheet 6

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

a.) $\lim_{n \rightarrow \infty} \left(1 + \frac{2}{n}\right)^n$ b.) $\lim_{n \rightarrow \infty} \left(1 - \frac{3}{n}\right)^n$ c.) $\lim_{n \rightarrow -\infty} \left(1 + \frac{1}{5n}\right)^{4n}$

d.) $\lim_{n \rightarrow \infty} \left(\frac{n+4}{n}\right)^{-n}$ e.) $\lim_{n \rightarrow -\infty} \left(\frac{n}{n-5}\right)^{2n}$ f.) $\lim_{h \rightarrow 0} (1+3h)^{2/h}$

3.) Solve for x .

a.) $\ln x = 3$ b.) $\ln x = \ln 3$ c.) $\ln(2x+1) - \ln(x+3) = 0$

d.) $\ln(x-1) + \ln(x-2) = 0$ e.) $\ln(x-2) + \ln(x+2) - \ln x = \ln 3$

4.) Let $f(x) = x^3 \ln x$. Solve $f'(x) = 0$ and $f''(x) = 0$ for x and set up a sign chart for each.

5.) Find $y' = \frac{dy}{dx}$ as simply as possible. Do not simplify your answers.

a.) $y = \ln(5x+7)$ b.) $y = \ln(\ln(\ln(\sin x)))$ c.) $y = \ln \left(\frac{x \cdot \sin(3x) \cdot (x-2)^4}{(x+1)^5 \cdot \cos(2x) \cdot \tan^{10} x} \right)$

d.) $y = x^{\ln 7}$ e.) $y = x^3 \cdot (x-1)^5 \cdot (2x+3)^7 \cdot (3x-4)^9 \cdot (4x+5)^{11}$

f.) $y = (2x)^{x+3}$ g.) $y = x^{y^2}$ h.) $y = x^{(y^{\sin x})}$ i.) $y = \log_5(\log_4(\log_3 2x))$

6.) Solve for x .

a.) $e^x = 2$ b.) $7 \cdot e^{2x+3} = e^{3-x}$ c.) $(e^x + 1)(e^x - 5) = 0$

d.) $e^{2x} - 4 \cdot e^x = 0$ e.) $e^{2x} - 5 \cdot e^x + 6 = 0$

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

a.) $y = 7 \cdot e^{5x-4}$ b.) $y = e^{x^2} \cdot \tan(3x)$ c.) $y = \frac{2^x + 4^x}{3^x + 5^x}$ d.) $y = 4^{3^{x^5}}$

8.) Find all horizontal asymptotes for the function in 7.)c.).

9.) Let $f(x) = x^2 \cdot e^{-x}$. Solve $f'(x) = 0$ and $f''(x) = 0$ for x and set up a sign chart for each.

11.) Differentiate.

a.) $y = \arctan(3x)$ b.) $y = x \cdot \arcsin(e^{2x})$ c.) $y = \arccos(\sin x^2)$

d.) $y = \cos^2((\arctan x)^3)$ e.) $y = \frac{\arccos x - \arctan x}{\arctan x - \arcsin x}$

f.) $y = \arcsin\left(\frac{x-1}{x+1}\right) + 2 \arctan \sqrt{x}$ (Simplify answer.)

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The following problem is for recreational purposes only.

12.) Find a hidden pattern and determine the next number in the sequence :

0, 1, 3, 7, 14, 25, 41, 63, ...