Math 21A
Vogler
Worksheet 6

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

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

d.) $\lim_{n\to\infty}\left(\frac{n+4}{n}\right)^{-n}$ e.) $\lim_{n\to-\infty}\left(\frac{n}{n-5}\right)^{2n}$ f.) $\lim_{h\to0}\left(1+3h\right)^{2/h}$

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.) $y = \dfrac{\arccos x - \arctan x}{\arctan x - \arcsin x}$

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

$0, 1, 3, 7, 14, 25, 41, 63, \cdots$

Thanks to Dr. Kouba