

Math 17A
Vogler
Discussion Sheet 3

1.) Determine a formula (starting with $n = 0$) for each of the following sequences.

- a.) $(1 + 1)^2, (1 + 1/2)^3, (1 + 1/3)^4, (1 + 1/4)^5, \dots$
 b.) $0, 1/5, 2/6, 3/7, 4/8, 5/9, \dots$ c.) $1, 0, 1, 4, 9, 16, \dots$
 d.) $1, -8, 27, -64, 125, -216, \dots$ e.) $3, 12, 27, 48, 75, 108, \dots$
 f.) $8, 10, 12, 14, 16, 18, \dots$ g.) $5/2, 25/4, 125/6, 625/8, \dots$
 h.) $1/9, 1/3, 1, 3, 9, 27, \dots$ i.) $1, 5, 10, 16, 23, 31, \dots$
 j.) $4, 2, 1, 1/2, 1/4, 1/8, \dots$ k.) $0, 2, 6, 12, 20, 30, \dots$
 l.) $1, -5, 9, -13, 17, -21, \dots$ m.) $-1, 1, -1, 1, -1, 1, \dots$
 n.) $1, -3, 1, -3, 1, -3, \dots$ o.) $0, 0, 0, 6, 24, 60, 120, 210, \dots$

3.) Use algebra to evaluate the following limits.

- a.) $\lim_{x \rightarrow 1} \frac{x^2 + 3x - 4}{x^2 - x}$ b.) $\lim_{x \rightarrow -1} \frac{x^3 + 1}{x^2 - 1}$ c.) $\lim_{x \rightarrow 2} \frac{\sqrt{x+2} - x}{x - 2}$
 d.) $\lim_{x \rightarrow 1} \frac{x^6 - 1}{x^8 - 1}$ e.) $\lim_{x \rightarrow 7} \cos \frac{\pi}{2}x$ f.) $\lim_{x \rightarrow -1} \tan \frac{3\pi}{4}x$
 g.) $\lim_{x \rightarrow \infty} \frac{3x - 4}{3x + 1000}$ h.) $\lim_{x \rightarrow \infty} \frac{2 - x}{x^2 + 5}$ i.) $\lim_{x \rightarrow \infty} \frac{x^2 - 16}{x + 16}$
 j.) $\lim_{x \rightarrow 3^+} \frac{x + 2}{x - 3}$ k.) $\lim_{x \rightarrow 3^-} \frac{x + 2}{x - 3}$ l.) $\lim_{x \rightarrow 0^-} \frac{x - 1}{x^2 + x}$
 m.) $\lim_{x \rightarrow \infty} (\sqrt{x + 100} - \sqrt{x})$ n.) $\lim_{x \rightarrow -\infty} \frac{x}{\sqrt{x^2 + 1}}$

4.) Assume that the weight N (in lbs.) at time t (in years) of a chimpanzee is given by the growth model $N = \frac{200e^t}{36 + 4e^t}$ for $t \geq 0$.

- a.) What is the chimp's weight at birth ? at 1 year ? at 2 years ?
 b.) When will the chimp reach a weight of 10 pounds ? 40 pounds ?
 c.) What weight can we expect the chimp to reach as $t \rightarrow \infty$?

d.) Use a graphing calculator to sketch this growth equation.

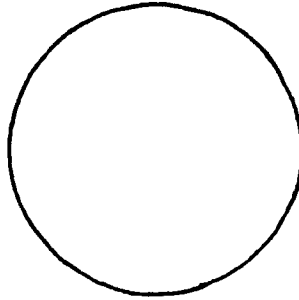
5.) Determine all constants A so that the $\lim_{x \rightarrow -1} f(x)$ exists :

$$f(x) = \begin{cases} x^2 + A, & \text{if } x < -1 \\ x + A^2, & \text{if } x \geq -1 \end{cases}$$

6.) Determine if the following function is continuous at $x = 0$:

$$g(x) = \begin{cases} \ln(x + e), & \text{if } x > 0 \\ 1, & \text{if } x = 0 \\ \frac{e^x + e^{-x}}{2}, & \text{if } x < 0 \end{cases}$$

7.) What is the maximum number of distinct, non-overlapping parts into which a circle can be divided using 100 (non-parallel) lines ?



8.) Consider the Beverton-Holt Growth Recursion given by $N_{t+1} = \frac{54N_t}{30 + N_t}$ with $N_0 = 5$.

- Find all fixed points for this recursion.
- Identify the growth parameter R and the carrying capacity K .
- Plot the linear graph of the parent/offspring ratio N_t/N_{t+1} vs. the amount N_t .
- Use the recursion to determine the values of N_t for $t = 0, 1, 2, 3, \dots, 10$.
- Plot the values you found in part d.).

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The following problem is for recreational purposes only.

8.) Without lifting your pencil, join all 16 dots with 6 straight lines.

