Math 130: Midterm 1
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Read carefully the following instructions:

- Write your name, section number, and problem number on EACH of the answer sheets. Do no more than ONE full problem per answer sheet, you may use the back or additional sheets if necessary.
- You may not use any books, notes, or calculators. If your solution contains exponentials or logarithms, you do not need to evaluate them.
- Show all your work and explain everything you write.
- Exam time: 75 minutes. Solve all 5 problems. The maximum grade is 100.
- Good luck!

Problems:

1. (40 points: each problem 10 points)

   Find the following limits (Show all your work. Final answers without work will get no credit even if they are correct).

   (a) $\displaystyle\lim_{x\to\infty} \frac{2x^2 - x + 1}{3 + 2x - x^2}$

   (b) $\displaystyle\lim_{x\to 1^+} \left[\log_{10} x + \frac{x^2 - 1}{x}\right]$

   (c) $\displaystyle\lim_{h\to 0} \frac{(x-h)^2 - (x+h)^2}{h}$

   (d) $\displaystyle\lim_{x\to 0} \frac{e^{(x+1)}(\sqrt{x+1} - 1)}{x}$

2. (10 points) Identify all the points where $y(t)$ is continuous. Justify your answer.

$$y(t) = \begin{cases} |t|, & t \le -3, \\ t, & -3 < t \le 0, \\ e^t - 1, & 0 < t \le 1, \\ 2t^2 + 3, & 1 < t \end{cases}$$

3. (15 points) Solve the following equations for x:

   (a) $2^{(x^2-9/4)} = 4^{2x}$ (8 points)

   (b) $\log_x 3 + \log_x \dfrac{2}{3} = 1$ (7 points)

4. (15 points) Let $y(t) = 2\cos\left(t + \frac{3}{4}\pi\right) + 1$.

   (a) What is the amplitude? (2 points)

   (b) What is the period? (3 points)

   (c) What is the phase shift? Is it a shift to the left or to the right? (3 points)

   (d) What is the vertical shift? Is this an upward or downward shift? (2 points)

   (e) Graph $y(t)$ for t between $-\pi$ and π. Label the axis. (5 points)

5. (20 points: each problem 5 points) Sketch the following functions. Write the values of all intercepts.

   (a) $f(x) = e^x$ for $x \in [-3, 3]$

   (b) $f(x) = \log_{10} x$ for $x \in [0, 5]$

   (c) $f(x) = \dfrac{1}{\log_{10} x}$ for $x \in [0, 5]$

   (d) $f(x) = \sin(2x)$ for $x \in [-\pi, \pi]$