

Calculus I Optional Take-Home Test 1

Limits

Number of questions—10

Directions: Solve each of the following problems using separate paper, while clearly indicating each problem number when solving. Irrelevant work will detract from your score, while answers without work shown will be awarded no credit. Answers with partially correct work will receive partial credit. Each problem is worth 10 points. You must work alone, but you may use a graphing calculator as a supplement to your own work if you indicate the steps used. You may not use a phone, computer, computational intelligence, AI, or other tools to assist you in solving the problems, nor may you have any of these devices in your possession while taking this test.

1. Find $\lim_{z \rightarrow 0} \frac{a}{2} (e^{\frac{z}{a}} + e^{-\frac{z}{a}})$.
2. Find $\lim_{x \rightarrow 0} \frac{3x^3 + 6x^2}{2x^4 - 15x^2}$.
3. Find $\lim_{x \rightarrow \infty} \frac{ax^2 + bx + c}{dx^2 + ex + f}$.
4. Find $\lim_{x \rightarrow 0} \frac{2x^3 + 3x^2}{x^3}$.
5. For what value of k is $f(x) = \begin{cases} \frac{\sqrt{2x+3} - \sqrt{x+6}}{2x-6}, & \text{for } x \neq 3, \\ k, & \text{for } x = 3, \end{cases}$ continuous?
6. Find $\lim_{x \rightarrow 0} \sqrt{x^3 + x^2} \sin \frac{\pi}{x}$.
7. Find $\lim_{h \rightarrow 0} \frac{(2+h)^3 - 8}{h}$.
8. Find $\lim_{x \rightarrow 4} \frac{\frac{1}{x+8} - \frac{1}{12}}{x-4}$.
9. Show that there is a root of the equation $\sqrt[3]{x} = 1 - x$ in the interval $(0, 1)$.
10. Find the horizontal and vertical asymptotes of the curve $y = \frac{2e^x}{e^x - 5}$.