Test #1
MATH 1634

January 30, 2026

DIRECTIONS: *This is the first test for this section of MATH 1634. The test contains ten problems counting ten points each or a total of 100 points. You must complete all the problems showing your work clearly and completely in the spaces provided. You may use your calculator, but you may not give assistance to or receive assistance from anyone or anything. To do so will result in you receiving a grade of F in the course.*

Good luck.

My signature below indicates that I have read and understand the instructions printed above and I agree to abide by them.

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Name (printed):______________________________

Problem 1. For the function $f(t)$ graphed here, find the following limits or explain why they do not exist.

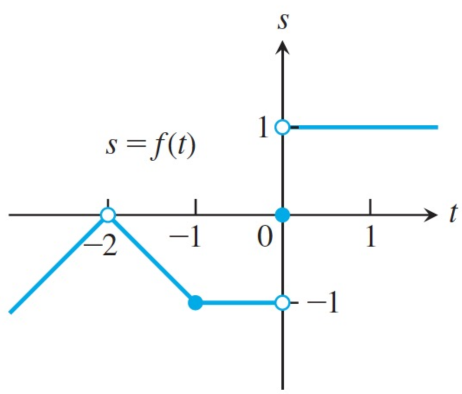

Figure 1: $y = f(t)$

(a) $\lim_{t \to -2} f(t)$

Solution.

$$\lim_{t \to -2} f(t) = 0.$$

(b) $\lim_{t \to -1} f(t)$

Solution.

$$\lim_{t \to -1} f(t) = -1.$$

(c) $\lim_{t \to 0} f(t)$

Solution. The limit $\lim_{t \to 0} f(t)$ does not exist since the right limit and the left limit are not equal.

(d) $\lim_{t \to -0.5} f(t)$

Solution.

$$\lim_{t \to -0.5} f(t) = -1.$$

Problem 2. Find the limit

$$\lim_{x\to 2}(-x^2+5x-2)$$

Solution.

$$\begin{aligned}\lim_{x\to 2}(-x^2+5x-2) &= -2^2+5(2)-2\\ &= 4.\end{aligned}$$

Problem 3. Find the limit

$$\lim_{x\to 2/3}(8-3x)(2x-1)$$

Solution.

$$\begin{aligned}\lim_{x\to 2/3}(8-3x)(2x-1) &= \left(8-3\left(\frac{2}{3}\right)\right)\left(2\left(\frac{2}{3}\right)-1\right)\\ &= (8-2)\left(\frac{4}{3}-1\right)\\ &= 6\cdot\frac{1}{3}\\ &= 2.\end{aligned}$$

Problem 4. Find the limit

$$\lim_{x \to 2} \frac{x+2}{x^2+5x+6}$$

Solution.

$$\begin{aligned} \lim_{x \to 2} \frac{x+2}{x^2+5x+6} &= \frac{2+2}{2^2+5(2)+6} \\ &= \frac{4}{20} \\ &= \frac{1}{5}. \end{aligned}$$

Problem 5. Find the limit

$$\lim_{x \to -3} \frac{x+3}{x^2+4x+3}$$

Solution.

$$\begin{aligned} \lim_{x \to -3} \frac{x+3}{x^2+4x+3} &= \lim_{x \to -3} \frac{x+3}{(x+3)(x+1)} \\ &= \lim_{x \to -3} \frac{1}{x+1} \\ &= \frac{1}{-3+1} \\ &= -\frac{1}{2}. \end{aligned}$$

Problem 6. Find the limit

$$\lim_{x\to -1} \frac{x^2+3x+2}{x^2-x-2}.$$

Solution.

$$\begin{aligned}
\lim_{x\to -1} \frac{x^2+3x+2}{x^2-x-2} &= \lim_{x\to -1} \frac{(x+1)(x+2)}{(x+1)(x-2)} \\
&= \lim_{x\to -1} \frac{x+2}{x-2} \\
&= \frac{-1+2}{-1-2} \\
&= -\frac{1}{3}.
\end{aligned}$$

Problem 7. Find the limit

$$\lim_{x\to 0} \sin x \cos x.$$

Solution.

$$\begin{aligned}
\lim_{x\to 0} \sin x \cos x &= \lim_{x\to 0} \sin x \cdot \lim_{x\to 0} \cos x \\
&= \sin 0 \cdot \cos 0 \\
&= 0 \cdot 1 \\
&= 0.
\end{aligned}$$

Problem 8. Find the limit
$$\lim_{x\to 0}\sqrt{8+\sec^2 x}$$

Solution.
$$\begin{aligned}\lim_{x\to 0}\sqrt{8+\sec^2 x} &= \sqrt{8+\sec^2 0}\\ &= \sqrt{8+1}\\ &= \sqrt{9}\\ &= 3.\end{aligned}$$

Problem 9. Let $f(x) = x^2$ and $x = 1$. Compute
$$\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}.$$

Solution.
$$\begin{aligned}\lim_{h\to 0}\frac{f(x+h)-f(x)}{h} &= \lim_{h\to 0}\frac{(1+h)^2-1}{h}\\ &= \lim_{h\to 0}\frac{(1+2h+h^2)-1}{h}\\ &= \lim_{h\to 0}\frac{2h+h^2}{h}\\ &= \lim_{h\to 0}\frac{h(2+h)}{h}\\ &= \lim_{h\to 0}(2+h)\\ &= 2+0\\ &= 2.\end{aligned}$$

Problem 10. Define
$$f(x) = \frac{x^2 + 3x - 10}{x - 2}, \quad x \neq 2.$$
Define $f(2)$ so that f is continuous at $x = 2$.

Solution. In order for f to be continuous at $x = 2$, we must have
$$\lim_{x \to 2} f(x) = f(2).$$
So, we **must** define $f(2)$ to be this limit—provided the limit exists.

We compute
$$\begin{aligned} \lim_{x \to 2} f(x) &= \lim_{x \to 2} \frac{x^2 + 3x - 10}{x - 2} \\ &= \lim_{x \to 2} \frac{(x-2)(x+5)}{x - 2} \\ &= \lim_{x \to 2} (x + 5) \\ &= 7. \end{aligned}$$
To make f continuous at $x = 2$, we must define $f(2) = 7$.