

Math 131 - Quiz 3

February 1, 2023

Name key

Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (2.5 points) Explain why direct substitution cannot be used to evaluate the limit. Then use a different approach to find the limit.

Direct subs gives

A ZERO DENOMINATOR

--- WE CANNOT GET
THE LIMIT THAT
WAY.

$$\lim_{x \rightarrow 5} \left(\frac{x^2 - 3x - 10}{x^2 + x - 30} \right)$$

0/0 More work!

$$= \lim_{x \rightarrow 5} \frac{(x-5)(x+2)}{(x+5)(x-6)} = \frac{5+2}{5+6}$$

$$= \boxed{\frac{7}{11}}$$

2. (2.5 points) Evaluate the limit: $\lim_{y \rightarrow 2} \frac{2y - 4}{\sqrt{y} - \sqrt{2}}$

0/0 More work!

$$\lim_{y \rightarrow 2} \frac{2(y-2)}{\sqrt{y} - \sqrt{2}} \cdot \frac{\sqrt{y} + \sqrt{2}}{\sqrt{y} + \sqrt{2}} = \lim_{y \rightarrow 2} \frac{2(y-2)(\sqrt{y} + \sqrt{2})}{(y-2)}$$

$$= 2(\sqrt{2} + \sqrt{2})$$

$$= \boxed{4\sqrt{2} \approx 5.657}$$

Turn over.

3. (1 point) Evaluate $\lim_{x \rightarrow 2^-} f(x)$, where $f(x) = \begin{cases} 2x^3 + \cos(\pi x), & -3 \leq x < 2 \\ x \sin(x), & x > 2 \end{cases}$

$$\begin{aligned} \lim_{x \rightarrow 2^-} f(x) &= \lim_{x \rightarrow 2^-} (2x^3 + \cos(\pi x)) \\ &= 2(2)^3 + \cos 2\pi = 16 + 1 = \boxed{17} \end{aligned}$$

4. (4 points) For each problem below, determine analytically whether the limit is $+\infty$, $-\infty$, or DNE. Show work or explain your reasoning.

(a) $\lim_{x \rightarrow 7^-} \left(\frac{3-x}{x-7} \right)$ $-4/0$ SOME KIND OF INF. LIMIT.

TO THE LEFT OF $x=7$...

$$\frac{3-x}{x-7} = \frac{\text{NEG}}{\text{NEG}} = \text{POS} \Rightarrow \boxed{\text{LIMIT IS } +\infty}$$

(b) $\lim_{x \rightarrow 4} \frac{2x+4}{(x-4)^2}$ $12/0$ SOME KIND OF INF. LIMIT

TO BOTH SIDES OF $x=4$...

$$\frac{2x+4}{(x-4)^2} = \frac{\text{POS}}{\text{POS}} = \text{POS} \quad \boxed{\text{LIMIT IS } +\infty}$$