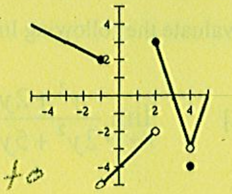
SCORE: $9\frac{1}{2}$ / 20 POINTS $\frac{1}{2} + 9$

1. NO CALCULATORS ALLOWED
2. UNLESS STATED OTHERWISE, YOU MUST SIMPLIFY ALL ANSWERS
3. SHOW PROPER CALCULUS LEVEL WORK TO JUSTIFY YOUR ANSWERS

The graph of f is shown on the right. Evaluate the following limits. Write "DNE" if a limit does not exist. SCORE: 0 / 3 PTS



[a] $\lim_{x\to 4}\frac{3x}{5-f(x)}$ $f(x) = -4$

$\lim_{x\to 4}\frac{3x}{5-4} = \lim_{x\to 4}\frac{3x}{1} = 12$

[b] $\lim_{x\to -1^+} f(x)$ DNE

The right hand limit $\neq$ to the Left hand limit

Prove that $\lim_{x\to 0} x^6\cos\frac{1}{x^3} = 0$. by using squeeze theorm SCORE: $2\frac{1}{2}$ / 3 PTS

$\lim_{x\to 0} x^6 \lim_{x\to 0}\cos\frac{1}{x^3}$

$\lim_{x\to 0} x^6 = 0^6 = 0$ $\frac{1}{2}$

$-1 \leq \cos\frac{1}{x^3} \leq 1$ by multiplying x^6

$-x^6 \leq x^6\cos\frac{1}{x^3} \leq x^6$ 1

by applying the limit to both sides

$0 \leq x^6\cos\frac{1}{x^3} \leq 0$

According to squeeze theorm $x^6\cos\frac{1}{x^3}$ is zero

so, $\lim_{x\to 0} x^6\cos\frac{1}{x^3} = 0$ ✓

1

If $\lim_{r\to -1}\frac{4+ar-r^6}{1+r}$ exists, find the value of a. $f(-1)$ for $4+ar-r^6$ should $=0$ so the limit will exists SCORE: 2 / 2 PTS

$4 - a - 1 = 0$ 1

$-a = -3$

$\boxed{a = 3}$ 1

$\lim_{x\to -1}\frac{4+3r-r^6}{1+r}$

Using complete sentences and proper mathematical notation, write the formal definition of "vertical asymptote". SCORE: 0 / 2 PTS

vertical asymptote:- The vertical asymptote is an imaginary line where the graph of a certain function $f(x)$ will never intersect with or will never cross it.

PARALLEL - SO NEVER CROSSES - VERTICAL ASYMP ?

Evaluate the following limits. Write "DNE" if a limit does not exist. SCORE: $4\frac{1}{2}$ / 7 PTS

[a] $\lim_{y \to -4} \frac{y^2+2y-8}{2y^2+5y-12}$

$(y+4)(y-2)$

$(2y-3)(y+4)$

$= \lim_{x \to -4} \frac{(y+4)(y-2)}{(2y-3)(y+4)}$

$= \boxed{\lim_{x \to -4} \frac{y-2}{2y-3}}$ 1

$= \frac{-4-6}{-8-3}$

$= \frac{-10}{-11} = \frac{10}{11}$

[b] $\lim_{b \to 3} \frac{b-\sqrt{b+6}}{6-2b} * \frac{b+\sqrt{b+6}}{b+\sqrt{b+6}}$

$\lim_{b \to 3} \frac{b^2-b+6}{6-2b(b+\sqrt{b+6})} * \frac{-2}{-2}$

$\lim_{b \to 3} \frac{(b-3)(b+2)}{6-2b(b+\sqrt{b+6})}$

$\boxed{\lim_{b \to 3} \frac{(b+2)}{-2(b+\sqrt{b+6})}}$ 1

$= \frac{3+2}{-2(3+3)} = \boxed{\frac{5}{-12}}$ $\frac{1}{2}$

[c] $\lim_{t \to -5} \frac{\frac{6}{t-1}-\frac{4}{t+3}}{t^2+25} = \frac{\frac{6}{-6}-\frac{4^2}{-2}}{25+25}$

$= \frac{-1-2}{50} = \boxed{\frac{-3}{50}}$

[d] $\lim_{x \to -2} f(x)$ where $f(x) = \begin{cases} 2x+1, & \text{if } x < -2 \\ x-1, & \text{if } -2 < x < 3 \\ 5-x, & \text{if } x > 3 \end{cases}$

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

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

$\lim_{x \to -2} f(x) = -3$ 1

because Left Sid limit = right side limit