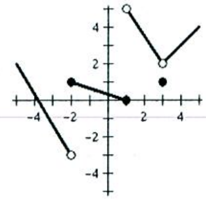
The graph of f is shown on the right. Evaluate the following limits. Write "DNE" if a limit does not exist. **SCORE: _____ / 3 PTS**



[a] $\lim_{x\to 3} \frac{2x}{5-f(x)}$

$= \boxed{\frac{\lim_{x\to 3} 2x}{\lim_{x\to 3} 5 - \lim_{x\to 3} f(x)}}$ 1

$= \frac{6}{5-2} = \frac{6}{3} = \boxed{2}$ 1

[b] $\lim_{x\to -2^+} f(x)$

$= \boxed{1}$ 1

Prove that $\lim_{x\to 0} x^6 \cos\frac{1}{x^3} = 0$. **SCORE: _____ / 3 PTS**

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

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

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

OK IF TOGETHER IN A COMPOUND EQUALITY

SO $\lim_{x\to 0} x^6 \cos\frac{1}{x^3} = 0$ BY SQUEEZE THEOREM 1

If $\lim_{r\to -1} \frac{4-ar-r^6}{1+r}$ exists, find the value of a. **SCORE: _____ / 2 PTS**

SINCE $\lim_{r\to -1} (1+r) = 0$, THE ORIGINAL LIMIT EXISTS ONLY

IF $\lim_{r\to -1} (4-ar-r^6) = 0$ IE. $4+a-1=0$ 1 (OK IF SIMPLIFIED)

$a = -3$ 1

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

f HAS A VERTICAL ASYMPTOTE AT a IFF

$\lim_{x\to a^+} f(x)=\infty$ OR $\lim_{x\to a^+} f(x)=-\infty$ OR $\lim_{x\to a^-} f(x)=\infty$ OR $\lim_{x\to a^-} f(x)=-\infty$

GRADED BY ME

Evaluate the following limits. Write "DNE" if a limit does not exist. **SCORE: _____ / 7 PTS**

[a] $\lim_{y\to -5} \dfrac{y^2+2y-15}{2y^2+5y-25}$ $\quad \dfrac{0}{0}$

$= \lim_{y\to -5} \dfrac{(y+5)(y-3)}{(y+5)(2y-5)}$

$= \boxed{\lim_{y\to -5} \dfrac{y-3}{2y-5}}$ (1)

$= \dfrac{-8}{-15} = \boxed{\dfrac{8}{15}}$ $\left(\frac{1}{2}\right)$

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

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

$= \lim_{b\to 2} \dfrac{(b-2)(b+1)}{-3(b-2)(b+\sqrt{b+2})}$

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

$= \dfrac{3}{(-3)4} = \boxed{-\dfrac{1}{4}}$ $\left(\frac{1}{2}\right)$

[c] $\lim_{t\to -4} \dfrac{\frac{5}{t-1}-\frac{6}{t+1}}{t^2+16}$

$= \dfrac{\frac{5}{-5}-\frac{6}{-3}}{16+16}$

$= \dfrac{-1+2}{32}$

$= \boxed{\dfrac{1}{32}}$ (1)

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

$\lim_{x\to 3^-} f(x) = \boxed{\lim_{x\to 3^-} (1-x) = -2}$ $\left(\frac{1}{2}\right)$ ← REQUIRED

$\lim_{x\to 3^+} f(x) = \boxed{\lim_{x\to 3^+} (x-5) = -2}$ $\left(\frac{1}{2}\right)$ ← REQUIRED

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