Evaluate the following limits. Write "DNE" if a limit does not exist. SCORE: _____ / 11 PTS

You do not need to show the use of the limit laws. However, it must be clear how you got your answers.

[a] $\lim\limits_{x\to -2} \dfrac{\frac{6}{4+x}-3}{1+\frac{2}{x}} \cdot \dfrac{x(4+x)}{x(4+x)}$

$= \lim\limits_{x\to -2} \dfrac{6x-3x(4+x)}{x(4+x)+2(4+x)}$

$= \boxed{\lim\limits_{x\to -2} \dfrac{3x(-x-2)}{(x+2)(4+x)}}$ $1\frac{1}{2}$

$= \boxed{\lim\limits_{x\to -2} \dfrac{-3x}{4+x}}$ 1

$= \dfrac{6}{2} = \boxed{3}$ 1

[b] $\lim\limits_{x\to 5} \dfrac{3-\sqrt{2x-1}}{x-5} \cdot \dfrac{3+\sqrt{2x-1}}{3+\sqrt{2x-1}}$

$= \lim\limits_{x\to 5} \dfrac{9-(2x-1)}{(x-5)(3+\sqrt{2x-1})}$

$= \boxed{\lim\limits_{x\to 5} \dfrac{-2x+10}{(x-5)(3+\sqrt{2x-1})}}$ $1\frac{1}{2}$

$= \boxed{\lim\limits_{x\to 5} \dfrac{-2}{3+\sqrt{2x-1}}}$ 1

$= \dfrac{-2}{6} = \boxed{-\dfrac{1}{3}}$ 1

[c] $\lim\limits_{x\to -4} f(x)$ if $f(x) = \begin{cases} \frac{x}{x+2}, & \text{if } x < -4 \\ 0, & \text{if } x = -4 \\ \sqrt[3]{4-x}, & \text{if } x > -4 \end{cases}$

$\lim\limits_{x\to -4^+} f(x) = \boxed{\lim\limits_{x\to -4^+} \sqrt[3]{4-x} = \sqrt[3]{8} = 2}$ 1

$\lim\limits_{x\to -4^-} f(x) = \boxed{\lim\limits_{x\to -4^-} \dfrac{x}{x+2} = \dfrac{-4}{-2} = 2}$ 1

$\lim\limits_{x\to -4} f(x) = 2$ 1

[d] $\lim\limits_{x\to 3} \dfrac{x^2+2x-3}{x^3-6x+9} = \dfrac{9+6-3}{27-18+9}$

$= \boxed{\dfrac{12}{18}} = \boxed{\dfrac{2}{3}}$

$\frac{1}{2}$ $\frac{1}{2}$

Sketch the graph of an example of a function that satisfies all the following conditions. **SCORE: ______ / 2 PTS**

The domain of the function is $[-5, 2) \cup (2, 5]$

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

$$\lim_{x \to -3^-} f(x) = 4$$

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

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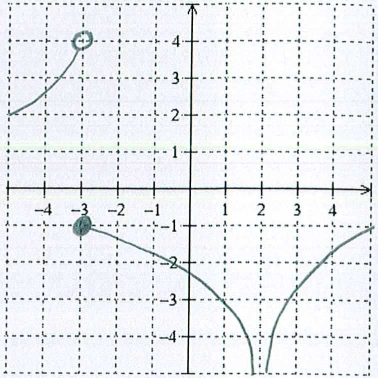
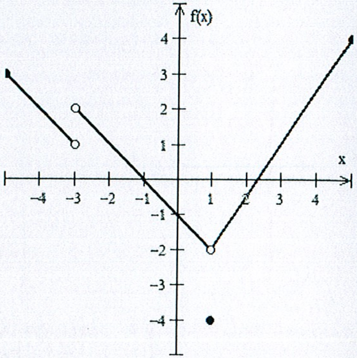


The graph of f is shown on the right. Evaluate the following limits. Write "DNE" if a limit does not exist. **SCORE: _____ / 4 PTS**



[a] $\lim_{x\to 1} \frac{x}{6-3f(x)}$ **Show the proper use of limit laws to find your anwer.**

$= \boxed{\dfrac{\lim_{x\to 1} x}{\lim_{x\to 1} 6 - \lim_{x\to 1} 3 \cdot \lim_{x\to 1} f(x)}}$ $1\frac{1}{2}$

$= \dfrac{1}{6-3\cdot\boxed{-2}} = \boxed{\dfrac{1}{12}}$ $\frac{1}{2}$

1

[b] $\lim_{x\to -3^+} f(x)$

$= \boxed{2}$

1

Prove that $\lim\limits_{x \to 0} x^2 \sin \dfrac{1}{x^3} = 0$. **SCORE: ______ / 4 PTS**

1 $-1 \le \sin \frac{1}{x^3} \le 1$, FOR ALL $x \neq 0$

1 $-x^2 \le x^2 \sin \frac{1}{x^3} \le x^2$

1 $\lim\limits_{x \to 0} -x^2 = 0 = \lim\limits_{x \to 0} x^2$

SO BY $\underbrace{\text{SQUEEZE THEOREM}}_{\frac{1}{2}}$, $\underbrace{\lim\limits_{x \to 0} x^2 \sin \frac{1}{x^3} = 0}_{\frac{1}{2}}$

Use your calculator to evaluate $\lim\limits_{x \to -1} \frac{2+2x}{x^2 - \sqrt{2x^6 - 1}}$.

SCORE: ______ / 1 PT

Fill in the table below showing the input and output values you used to arrive at your answer.
You must use at least 6 **appropriate** input values.

Input value	Output value
-1.1	0.51986
-1.01	0.50459
-1.001	0.50005
-0.999	0.4995
-0.99	0.49456
-0.9	0.35763

Final answer = 0.5

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Let P be the point on the curve of $f(x) = \sqrt{1 - x + 3x^2}$ where $x = 3$. **SCORE: ______ / 2 PTS**

[a] If Q is the point on the same curve where $x = b$, write the expression for the slope of the secant line PQ. $\dfrac{\sqrt{1-b+3b^2} - 5}{b-3}$

NOTE: Your answer may use the formula for *f*, but must not use "*f* ( )" notation itself.

[b] Use your calculator to evaluate the slope of 6 **appropriate** secant lines, then guess the slope of the tangent line at P. Fill in the table below showing the values of b and the corresponding slopes you used to arrive at your answer.

Slope of tangent line = 1.7

b	Slope of secant line
3.1	1.7011
3.01	1.7001
3.001	1.7
2.999	1.7
2.99	1.6999
2.9	1.6989

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