Evaluate the following limits. Write "DNE" if a limit does not exist.

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

SCORE: _____ / 11 PTS

[a] $\lim_{x\to 3}\dfrac{x^3-6x+9}{x^2+2x-3} = \dfrac{27-18+9}{9+6-3}$

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

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

[b] $\lim_{x\to -4} f(x)$ if $f(x)=\begin{cases}\sqrt[3]{x-4}, & \text{if } x<-4\\ 0, & \text{if } x=-4\\ \frac{x}{x+6}, & \text{if } x>-4\end{cases}$

$\lim_{x\to -4^+} f(x) = \lim_{x\to -4^+}\dfrac{x}{x+6} = \dfrac{-4}{2} = -2$ 1

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

$\boxed{\lim_{x\to -4} f(x) = -2}$ 1

[c] $\lim_{x\to 5}\dfrac{x-5}{3-\sqrt{2x-1}} \cdot \dfrac{3+\sqrt{2x-1}}{3+\sqrt{2x-1}}$

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

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

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

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

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

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

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

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

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

Prove that $\lim_{x \to 0} x^4 \sin \frac{1}{x^2} = 0$. SCORE: ______ / 4 PTS

1 $\boxed{-1 \leq \sin \frac{1}{x^2} \leq 1}$ FOR ALL $x \neq 0$

1 $\boxed{-x^4 \leq x^4 \sin \frac{1}{x^2} \leq x^4}$

1 $\boxed{\lim_{x \to 0} -x^4 = 0 = \lim_{x \to 0} x^4}$

SO, BY SQUEEZE THEOREM, $\lim_{x \to 0} x^4 \sin \frac{1}{x^2} = 0$

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

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] $\lim_{x\to 3} \frac{x}{5-4f(x)}$ ← **<u>Show the proper use of limit laws to find your anwer.</u>**

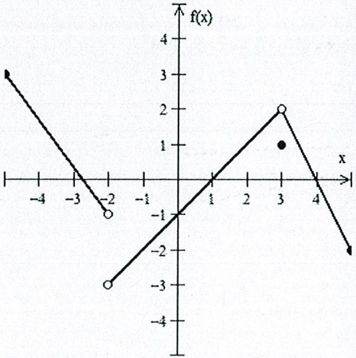
$$= \boxed{\frac{\lim_{x\to 3} x}{\lim_{x\to 3} 5 - \lim_{x\to 3} 4 \cdot \lim_{x\to 3} f(x)}} \quad 1\tfrac{1}{2}$$

$$= \frac{3}{5-4\cdot\boxed{2}} \quad 1$$

$$= \frac{3}{-3} = \boxed{-1} \quad \tfrac{1}{2}$$

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

$= \boxed{-3}$ 1



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

The domain of the function is $[-5, 4) \cup (4, 5]$

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

$$\lim_{x \to -1^-} f(x) = -4$$

$$\lim_{x \to 4} f(x) = \infty$$

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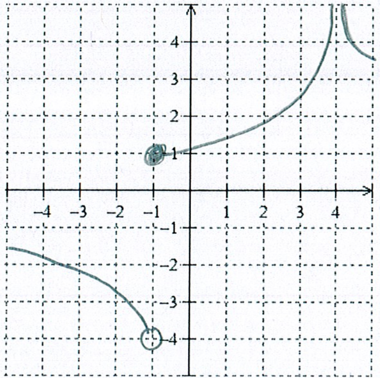

Let P be the point on the curve of $f(x)=\sqrt{1-x+3x^2}$ where $x=3$. **SCORE: ______ / 2 PTS**

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

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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