Name: _____

> Answer the questions in the spaces provided on the following pages. If you run out of
> room for an answer, continue on the back of the page. Show **all** your work!

1. For the function $f(x) = \dfrac{8 - x^3}{x^2 - 4}$ evaluate $\lim\limits_{x \to 2} f(x)$ using a table

Solution:

x	$f(x)$
$2 - 0.1 = 1.9$	$f(1.9) = -2.925641$
$2 - 0.01 = 1.99$	$f(1.99) = -2.9925063$
$2 - 0.001 = 1.999$	$f(1.999) = -2.9992501$
$2 + 0.001 = 2.001$	$f(2.001) = -3.0007501$
$2 + 0.01 = 2.01$	$f(2.01) = -3.0075062$
$2 + 0.1 = 2.1$	$f(2.1) = -3.0756098$

So, as our x values tend towards $x = 1$ it seems that $f(x)$ also tends to 1. Thus,

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

2. Evaluate $\lim\limits_{x \to 4} \dfrac{x^3 - 64}{x - 4}$

Solution:

$$\begin{aligned}
\lim\limits_{x \to 4} \frac{x^3 - 64}{x - 4} &= \lim\limits_{x \to 4} \frac{(x - 4)\left(x^2 + 4x + 16\right)}{x - 4} \\
&= \lim\limits_{x \to 4} \frac{\cancel{(x - 4)}\left(x^2 + 4x + 16\right)}{\cancel{x - 4}} \\
&= \lim\limits_{x \to 4} x^2 + 4x + 16 = \boxed{48}
\end{aligned}$$

3. Evaluate $\lim\limits_{x \to 2} 2x^2 - 9x + 3$

Solution:
$$\lim\limits_{x \to 2} 2x^2 - 9x + 2 = \boxed{-8}$$

4. Evaluate $\lim\limits_{x \to -9} \dfrac{x^2 - 3x - 108}{x^2 + 2x - 63}$

Solution:

$$\lim_{x \to -9} \frac{x^2 - 3x - 108}{x^2 + 2x - 63} = \lim_{x \to -7} \frac{(x + 9)(x - 12)}{(x + 9)(x - 7)}$$

$$= \lim_{x \to -9} \frac{\cancel{(x + 9)}(x - 12)}{\cancel{(x - 9)}(x - 7)}$$

$$= \lim_{x \to -9} \frac{x - 12}{x - 7} = \boxed{\frac{21}{15} = 75}$$

5. Evaluate $\lim\limits_{x \to 2} \left(8 - 3x + 12x^2\right)$

Solution:

$$\lim_{x \to 2} \left(8 - 3x + 12x^2\right) = \boxed{50}$$

6. Evaluate $\lim\limits_{x \to -5} \dfrac{x^2 + 6x + 5}{x^2 + 2x - 15}$

Solution:

$$\begin{aligned}
\lim_{x \to -5} \frac{x^2 + 6x + 5}{x^2 + 2x - 15} &= \lim_{x \to -5} \frac{(x + 5)(x + 1)}{(x + 5)(x - 3)} \\
&= \lim_{x \to -5} \frac{\cancel{(x + 5)}(x + 1)}{\cancel{(x + 5)}(x - 3)} \\
&= \lim_{x \to -5} \frac{x + 1}{x - 3} \\
&= \boxed{-\frac{4}{8} = -\frac{1}{2}}
\end{aligned}$$

7. Evaluate $\lim\limits_{w \to -4} \dfrac{w^2 - 16}{(w - 2)(w + 3) - 6}$

Solution:

$$\begin{aligned}
\lim_{x \to -4} \frac{w^2 - 16}{(w - 2)(w + 3) - 6} &= \lim_{x \to -4} \frac{\left(w^2 - 16\right)}{(w^2 + w - 6) - 6} \\
&= \lim_{w \to -4} \frac{\left(w^2 - 16\right)}{w^2 + w - 12} \\
&= \lim_{w \to -4} \frac{(w + 4)(w - 4)}{(w + 4)(w - 3)} \\
&= \lim_{w \to -4} \frac{\cancel{(w + 4)}(w - 4)}{\cancel{(w + 4)}(w - 3)} \\
&= \lim_{w \to -4} \frac{w - 4}{w - 3} \\
&= \boxed{-\frac{8}{7}}
\end{aligned}$$

8. Evaluate $\lim\limits_{x \to -2} f(x)$ for the following function

$$f(x) = \begin{cases} \dfrac{1}{x-2} & \text{if } x \neq -2 \\ 123 & \text{if } x = -2 \end{cases}$$

Solution: Remember that we just care about the function *around* $x = -2$ and not *at* $x = -2$

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

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9. Given the below graph of some function $g(x)$, evaluate the following

   (a) $\lim\limits_{x \to 0} g(x)$

   Solution:

   $$\lim_{x \to 0} g(x) = 0$$

   (b) $\lim\limits_{x \to -3} g(x)$

   Solution:

   $$\lim_{x \to -3} g(x) = 3$$

   (c) $\lim\limits_{x \to 1} g(x)$

   Solution:

   $$\lim_{x \to 1} g(x) = 2$$