Homework #2.00 Worksheet

1a) $\lim\limits_{x\to -2^+} f(x) = -1$, but we don't know $\lim\limits_{x\to -2^-} f(x)$ so $\lim\limits_{x\to -2} f(x)$ does not exist.

1b) $\lim\limits_{x\to 0^+} f(x) = 0$ and $\lim\limits_{x\to 0^-} f(x) = 1$ so $\lim\limits_{x\to 0} f(x)$ does not exist.

1c) $\lim\limits_{x\to 2^+} f(x) = \lim\limits_{x\to 2^-} f(x) = -2$ so $\lim\limits_{x\to 2} f(x) = -2$

1d) $\lim\limits_{x\to 4^+} f(x)$ we don't know and $\lim\limits_{x\to 4^-} f(x) = 0$ so $\lim\limits_{x\to 4} f(x)$ does not exist.

2a) $\lim\limits_{x\to 2} (5x^2 - 3x + 1) = 5\lim\limits_{x\to 2} x^2 - 3\lim\limits_{x\to 2} x + \lim\limits_{x\to 2} 1$

$= 5(2)^2 - 3(2) + 1 = \boxed{15}$

2b) $\lim\limits_{x\to 0} (x\cos 2x) = \lim\limits_{x\to 0} x \cdot \lim\limits_{x\to 0} \cos 2x$

$= 0 \cdot \cos 2(0) = 0 \cdot 1 = \boxed{0}$

2c) $\lim\limits_{x\to -1} \dfrac{3x^2 - 2x - 1}{x^2+1} = \dfrac{\lim\limits_{x\to -1} (3x^2 - 2x - 1)}{\lim\limits_{x\to -1} (x^2+1)} = \dfrac{3(-1)^2 - 2(-1) - 1}{(-1)^2+1}$

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

2d) $\lim\limits_{x\to -2} \dfrac{x^3+8}{x^2-4} = \lim\limits_{x\to -2} \dfrac{\cancel{(x+2)}(x^2-2x+4)}{\cancel{(x+2)}(x-2)}$

$= \dfrac{(-2)^2 - 2(2) + 4}{-2-2} = \dfrac{4-4+4}{-4} = \boxed{-1}$

2e) $\lim\limits_{x\to \infty} \dfrac{3-x}{4+x+x^2} = \lim\limits_{x\to \infty} \dfrac{-x+3}{x^2+x+4} = 0$ since degree of numerator < degree of denominator

3a) $f(x+h) = 5(x+h)^2 - 8(x+h) + 17$

$= 5(x^2 + 2xh + h^2) - 8x - 8h + 17$

$= \boxed{5x^2 + 10xh + 5h^2 - 8x - 8h + 17}$

3b) $\lim\limits_{h\to 0} \dfrac{f(x+h) - f(x)}{h} = \lim\limits_{h\to 0} \dfrac{5x^2 + 10xh + 5h^2 - 8x - 8h + 17 - (5x^2 - 8x + 17)}{h}$

$= \lim\limits_{h\to 0} \dfrac{\cancel{5x^2} + 10xh + 5h^2 \cancel{- 8x} - 8h \cancel{+ 17} \cancel{- 5x^2} \cancel{+ 8x} \cancel{- 17}}{h}$

$= \lim\limits_{h\to 0} \dfrac{10xh + 5h^2 - 8h}{h}$

$= \lim\limits_{h\to 0} \dfrac{\cancel{h}(10x + 5h - 8)}{\cancel{h}} = 10x + 5(0) - 8 = \boxed{10x - 8}$

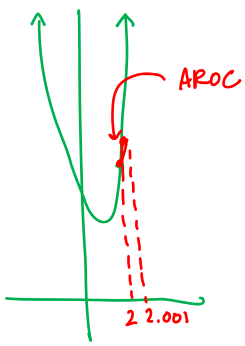
3c) $(2, 21)$ $(2.001, 21.012005)$

$$\text{average rate of change} = \frac{f(2.001) - f(2)}{2.001 - 2}$$

$$= \frac{21.012005 - 21}{.001}$$

$$= \frac{.012005}{.001} = \boxed{12.005}$$

3d)



tangent line $y - 21 = 12.005(x - 2)$