SOLUTIONS PRACTISE TEST #1

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

(2) $\lim\limits_{x\to 1} \frac{x^2+2}{x-1} = 3/0$ $\boxed{\text{does not exist}}$

(3) $\lim\limits_{x\to\infty} \frac{x^3-2x+1}{3x^3+4x-1} = \lim\limits_{x\to\infty} \frac{x^3/x^3 - 2x/x^3 + 1/x^3}{3x^3/x^3 + 4x/x^3 - 1/x^3}$

$= \lim\limits_{x\to\infty} \frac{1 - 2/x^2 + 1/x^3}{3 + 4/x^2 - 1/x^3}$

$= \boxed{1/3}$

(4) $\lim\limits_{x\to 0} \frac{\frac{1}{x-1} + \frac{1}{x+1}}{x} = \lim\limits_{x\to 0} \frac{\frac{x+1+x-1}{(x-1)(x+1)}}{x}$

$= \lim\limits_{x\to 0} \frac{2\cancel{x}}{(x-1)(x+1)\cancel{x}} = \frac{2}{-1(1)} = \boxed{-2}$

(5) $\lim\limits_{x\to 1^+} f(x) = \lim\limits_{x\to 1} x^2-1 = 0$

$\lim\limits_{x\to 1^-} f(x) = \lim\limits_{x\to 1} x^2-2x+1 = 0$

so the limit exists $\lim\limits_{x\to 1} f(x) = 0$

BUT $f(1) = 2$

since $\lim\limits_{x\to 1} f(x) \neq f(1)$ Not continuous

(6) $f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$

$= \lim_{h\to 0} \frac{\boxed{(x+h)^2-(x+h)+1} - (x^2-x+1)}{h}$

$= \lim_{h\to 0} \frac{\cancel{x^2}+2xh+h^2-\cancel{x}-h+\cancel{1}-\cancel{x^2}+\cancel{x}-\cancel{1}}{h}$

$= \lim_{h\to 0} \frac{2xh+h^2-h}{h}$

$= \lim_{h\to 0} \frac{\cancel{h}(2x+h-1)}{\cancel{h}} = 2x-1$

(7) ⓐ $f(x) = x^2-3x+5/2$

$\boxed{f'(x) = 2x-3}$

ⓑ $f(x) = \frac{1}{x^8} + x^{2/3}$

$= x^{-8} + x^{2/3}$

$\boxed{f'(x) = -8x^{-9} + \frac{2}{3}x^{-1/3}}$

ⓒ $f(x) = \frac{2x^3 - x^{1/2}}{x^{3/2}}$

$= 2x^{3/2} - x^{-1}$

$\boxed{f'(x) = 3x^{1/2} + x^{-2}}$

ⓓ $f(x) = x^{-7} + 281$ $\boxed{f'(x) = -7x^{-8}}$

ⓔ $f(x) = (x+1)(2x+3) = 2x^2+5x+3$

$\boxed{f'(x) = 4x+5}$

ⓕ $f(x) = 3x^{-1/3} + x^{-5/2}$ $\boxed{f'(x) = -x^{-4/3} - \frac{5}{2}x^{-7/2}}$