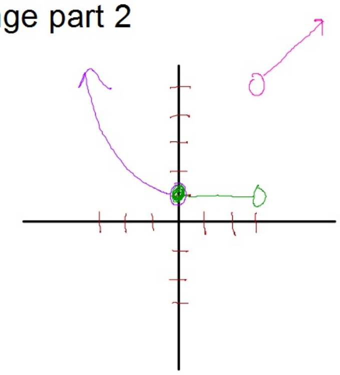
Warm-Up 9/16

Day after rates of change part 2

1) $$h(x)=\begin{cases} x^2+1 & x<0 \\ 1 & 0\le x<3 \\ x+2 & x>3 \end{cases}$$



a) Graph h(x)

b) Is h(x) continuous at x=0?
Explain using the definition of continuity.

h(x) is continuous at x=0, b/c
- h(0) exists
- $\lim_{x\to 0} h(0)$ exists
- and $h(0)=\lim_{x\to 0} h(x)$

c) Is h(x) continuous at x=3?
Explain using the definition of continuity.

h(x) is not continuous at X=3, b/c h(3) d.n.e.

OR

h(x) is not continuous at X=3, b/c $\lim_{x\to 3} h(x)$ d.n.e

2) $g(x)=x^2-4x$

a) Find the average rate of change of g(x) on $[0,2]$.

$$\frac{g(2)-g(0)}{2\ \ 0} = \frac{[(2)^2-4(2)]-[(0)^2-4(0)]}{2\ \ 0} = \frac{[-4]-[0]}{2} = -2$$

b) Find the instantanous rate of change of g(x) at x=5.

$$\lim_{h\to 0}\frac{[(5+h)^2\ 4(5+h)]-[(5)^2-4(5)]}{(5+h)-(5)}$$

$$=\lim_{h\to 0}\frac{[25+10h+h^2\ \ 20-4h]-[5]}{h}$$

$$=\lim_{h\to 0}\frac{10h+h^2-4h}{h}$$

$$=\lim_{h\to 0} 10+h-4$$

$$=\boxed{6}$$

$g(5)=5^2-4(5)$
$=25-20$
$=5$

c) Write the equation of the line tangent to g at x=5.

point: $(5, g(5))$, $(5,5)$

slope: $f'(5)=6$

$y-5=6(x-5)$

d) Write the equation of the line normal to g at x=5.

point: $(5,5)$

slope: $\perp f'(5) -\frac{1}{6}$

$y-5=\frac{1}{6}(x\ 5)$