HW 2.4 p. 92 # 1, 6, 7, 9-15 odd, 16, 23

Monday, September 22, 2014 8:44 PM

1. $f(x)=x^3+1$

a) $[2,3]$

$avg=\frac{f(3)-f(2)}{3-2}=\frac{28-9}{1}=19$

b) $[-1,1]$

$avg=\frac{f(1)-f(-1)}{1--1}=\frac{2-0}{2}=1$

6. $f(x)=2+\cos x$

a) $[0,\pi]$

$avg=\frac{f(\pi)-f(0)}{\pi-0}=\frac{1-3}{\pi}=\frac{-2}{\pi}$

b) $[-\pi,\pi]$

$avg=\frac{f(\pi)-f(-\pi)}{\pi--\pi}=\frac{1-1}{2\pi}=0$

7. a)

Secant	Slope
PQ_1	43
PQ_2	46
PQ_3	50
PQ_4	50

Units are meters/second

b) $m(P)\approx 50$ m/s

11. $y=\frac{1}{x-1}$ at $x=2$

ⓐ $m=\lim_{h\to0}\frac{f(2+h)-f(2)}{h}$

$=\lim_{h\to0}\frac{\frac{1}{2+h-1}-\frac{1}{2-1}}{h}$

$=\lim_{h\to0}\frac{\frac{1}{1+h}-1}{h}\cdot\frac{(1+h)}{(1+h)}=$

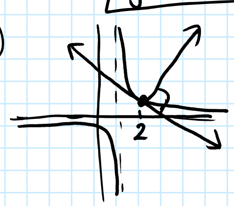
$=\lim_{h\to0}\frac{1-(1+h)}{h(1+h)}=\lim_{h\to0}\frac{-h}{h(1+h)}$

$=\lim_{h\to0}\frac{-1}{1+h}=\boxed{-1}$

ⓑ Tan: $\boxed{y-1=-1(x-2)}$

ⓒ Normal: $\boxed{y-1=1(x-2)}$

ⓓ



9. $y=x^2$ at $x=-2$

ⓐ $m=\lim_{h\to0}\frac{f(-2+h)-f(-2)}{h}=\lim_{h\to0}\frac{(-2+h)^2-(-2)^2}{h}$

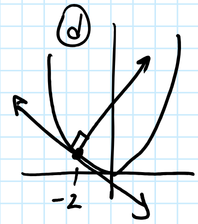
$=\lim_{h\to0}\frac{4-4h+h^2-4}{h}=\lim_{h\to0}\frac{-4h+h^2}{h}$

$=\lim_{h\to0}-4+h=\boxed{-4}$

ⓑ Tangent: $\boxed{y-4=-4(x+2)}$

ⓒ Normal: $\boxed{y-4=\frac{1}{4}(x+2)}$

ⓓ



13. $y=|x|$

a) $x=2$ $m=1$

b) $x=-3$ $m=-1$

15. $f(x)=\begin{cases}2-2x-x^2 & x<0\\ 2x+2 & x\geq0\end{cases}$ at $x=0$

$f(0)=2$

m from left $=\lim$ $\frac{2-2(0+h)-(0+h)^2-(2)}{}$

$m=1$ $m=-1$

16. $f(x)=\begin{cases} -x, & x<0 \\ x^2-x, & x\geq 0 \end{cases}$ at $x=0$

$f(0)=0$

m from left $=\lim_{h\to 0}\frac{-(0+h)-0}{h}$

$=\lim_{h\to 0}\frac{-h}{h}=\boxed{-1}$

m from right $=\lim_{h\to 0}\frac{(0+h)^2-(0+h)-0}{h}$

$=\lim_{h\to 0}\frac{h^2-h}{h}=\lim_{h\to 0}h-1=\boxed{-1}$

Yes slope from both sides $=-1$.

$f(0)=2$ $\quad 2x+2 \quad x\geq 0$

m from left $=\lim_{h\to 0}\frac{2-2(0+h)-(0+h)^2-(2)}{h}$

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

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

m from right $=\lim_{h\to 0}\frac{2(0+h)+2-2}{h}$

$=\lim_{h\to 0}\frac{2h}{h}=\lim_{h\to 0}2=2$

Slopes $\neq$ so there is no tangent to curve at $x=0$.

23. $f(t)=3t-7$ $\quad t=1$ $\quad$ IROC = slope at $t=1$ = $\boxed{3\text{ ft/sec}}$