HW 3.1 Day 1 p. 105 #1, 5, 7, 9, 12-17, 23, 33, 36-38

Thursday, September 25, 2014 9:44 PM

(1) $f(x)=\frac{1}{x}$, $a=2$

$$f'(2)=\lim_{h\to 0}\frac{\frac{1}{2+h}-\frac{1}{2}}{h}\cdot\frac{(2(2+h))}{(2(2+h))}=$$

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

$$=\frac{-1}{2(2+0)}=\boxed{\frac{-1}{4}}$$

(5) $f(x)=\frac{1}{x}$, $a=2$

$$f'(2)=\lim_{x\to 2}\frac{\frac{1}{x}-\frac{1}{2}}{x-2}\cdot\frac{(2x)}{(2x)}=\lim_{x\to 2}\frac{2-x}{2x(x-2)}$$

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

(7) $f(x)=\sqrt{x+1}$, $a=3$

$$f'(3)=\lim_{x\to 3}\frac{\sqrt{x+1}-\sqrt{3+1}}{x-3}=\lim_{x\to 3}\frac{\sqrt{x+1}-2}{x-3}\cdot\frac{\sqrt{x+1}+2}{\sqrt{x+1}+2}$$

$$=\lim_{x\to 3}\frac{x+1-4}{(x-3)(\sqrt{x+1}+2)}\quad=\lim_{x\to 3}\frac{\cancel{x-3}}{\cancel{(x-3)}(\sqrt{x+1}+2)}=$$

$$=\lim_{x\to 3}\frac{1}{\sqrt{x+1}+2}=\frac{1}{2+2}=\boxed{\frac{1}{4}}$$

(9) $f(x)=3x-12$

$$f'(x)=\lim_{h\to 0}\frac{3(x+h)-12-(3x-12)}{h}$$

$$=\lim_{h\to 0}\frac{\cancel{3x}+3\cancel{h}-\cancel{12}-\cancel{3x}+\cancel{12}}{\cancel{h}}$$

$$=\lim_{h\to 0}3=\boxed{3}$$

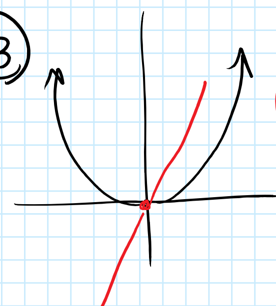
(12) $f(x)=3x^2$

$$\frac{d}{dx}f(x)=\lim_{h\to 0}\frac{3(x+h)^2-3x^2}{h}=$$

$$=\lim_{h\to 0}\frac{\cancel{3x^2}+6xh+3h^2-\cancel{3x^2}}{h}=$$

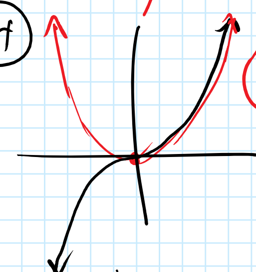
$$=\lim_{h\to 0}6x+3h=\boxed{6x}$$

(13)



(b)

(14)



(a)

(15)

(d)

(16)

(c)

(17) $f(2)=3$ (point) $f'(2)=5$ = m of tangent

(a) tan: $y-3=5(x-2)$

(36) True. $f(x)$ is continuous on $\mathbb{R}$

point

(a) tan: $y-3=5(x-2)$

(b) normal: $y-3=\frac{-1}{5}(x-2)$

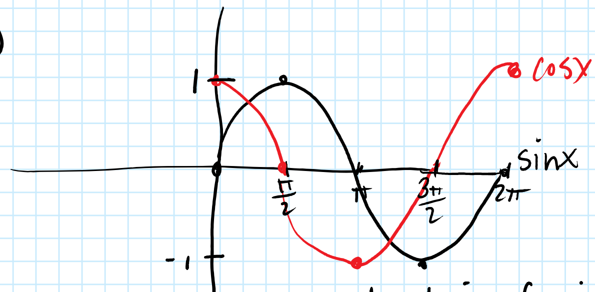
(23) (a) largest $f'=0$ (Max)

smallest $f'=0$ (min)

(b) f' largest: 120,000

f' smallest: 60,000

(33)



Cosine x could be derivative of sine x because where sine is increasing, cosx is positive and where sine is decreasing (neg slope) cosx is negative.

(36) True. $f(x)$ is continuous on $\mathbb{R}$ and has no sharp corners.

(37) False. could be a sharp corner, such as $y=|x|$

(38) $f'(-1)=-3$ $\boxed{C}$