Homework 3-1:

① $f(x)=\sqrt{60}$

$f'(x)=0$

② $f(x)=-4x^{-4}$

$f'(x)=16x^{-5}=\frac{16}{x^5}$

$f'(1)=16$; $f'(-1)=-16$

③ $f(x)=11x^2+5x$

$f'(x)=22x+5=\frac{dy}{dx}$

$f'(2)=44+5=49$

$f'(3)=66+5=71$

$f(2)=11(4)+10=54$

$f(3)=11(9)+15=114$

$b=54-98=-44$

$b_3=114-71(3)=-99$

$y=49x-44$ &

$y=71x-99$

$f'(x)=0$ where tangent is horizontal

$22x+5=0$; $x=\frac{-5}{22}$

④ $f(x)=(7x^2-3)(3x+3)$

$f'=14x$; $g'=3$

$14x(3x+3)+3(7x^2-3)$

$42x^2+42+21x^2-9$

$63x^2+42x-9$

$f'(1)=63+42-9=96$

⑤ $f(x)=5x^8-3x^5-2x^3+5x$

$f'(x)=40x^7-15x^4-6x^2+5$

$f'(1)=40-15-6+5=24$

$f''(x)=280x^6-60x^3-12x$

$f''(1)=280-60-12=208$

⑥ $f(x)=\frac{x^4+2x^3+6}{x^2}=x^2+2x+\frac{6}{x^2}$

$f'(x)=2x+2-\frac{12}{x^3}$

$f'(-2)=2(-2)+2+\frac{12}{8}=-2+\frac{12}{8}$

$f'(+3)=2(+3)+2-\frac{12}{27}=8-\frac{12}{27}$

⑦ $f(x)=\begin{cases} 6x^3-5x^2+6 & : x<-2 \\ ax+b & : x\geq -2 \end{cases}$

$f'(x)=18x^2-10x=a$

$f(x)=6x^3-5x^2+6=ax+b$

$f'(x)$: $a=92$

$f(x)$: $-62=-184+b$; $b=122$

$a=92$ & $b=122$

⑨ $f(x)=x+\sqrt{x}$; $f'(x)=1+\frac{1}{2\sqrt{x}}$

$f'(4)=1+\frac{1}{2(2)}=1+\frac{1}{4}=\boxed{\frac{5}{4}}$

⑩ $f(x)=-4x^6\sqrt{x}-\frac{2}{x^3\sqrt{x}}$

$f(x)=-4x^{13/2}-2/x^{7/2}$

Continued:

(10) $f(x) = -4x^6\sqrt{x} - \frac{2}{x^3\sqrt{x}}$

$f(x) = -4x^{13/2} - 2/x^{7/2}$

$\frac{dy}{dx} = -26x^{11/2} + 7x^{-9/2}$

(11) $f(x) = \sqrt{23x}$; $\sqrt{23}x^{1/2}$

$\frac{dy}{dx} = \frac{\sqrt{23}}{2\sqrt{x}}$ or $\frac{\sqrt{23}}{2}x^{-1/2}$

(12) $f(x) = 2e^x + 10x$

$\frac{dy}{dx} = 2e^x + 10$

cuz $\frac{dy}{dx}$ of $e^x = e^x$

(13) $f(x) = 11x^e + 2e^x$

$\frac{dy}{dx} = \frac{11ex^e}{x} + 2e^x$

cuz $f'(x)$ of $e^x = e^x$

$f'(2) = \frac{11}{2}e2^e + 2e^2$

(14) $f(x) = e^{x+3} + 3$; $e^x \cdot e^3 + 3$

$\frac{dy}{dx} = e^3e^x$

cuz $f'(x)$ of $e^x = e^x$

(15) $\lim_{x\to 1} \frac{x^{900}-1}{x-1}$; $f(x) = x^{900}$

$f'(x) = 900x^{899}$ then

$f'(1) = 900$

(8) $f(x) = |x-2| + |x+6|$

then the domain is no sharp corners ie

$x \in (-\infty,-6) \cup (-6,2) \cup (2,\infty)$