p. 91 # 12) $f(x)=ax^2+bx+c$

$(2,19)$ $(-1,-8)$

H.T. $m=0$

$$f'(x)=2ax+b$$
$$0=2a(-1)+b$$
$$0=-2a+b$$
$$2a=b$$

$$19=a(2)^2+b(2)+c$$
$$19=a(2)^2+2a(2)+c$$
$$19=4a+4a+c$$
$$19=8a+c \quad \checkmark$$

$$-8=a(-1)^2+b(-1)+c$$
$$-8=a-b+c$$
$$-8=a-(2a)+c$$
$$-8=-a+c \quad \checkmark$$

$$
\begin{array}{rl}
 & 19=8a+c \\
- & -8=-a+c \\
\hline
 & 27=9a \\
 & 3=a
\end{array}
$$

$$19=8(3)+c$$
$$-5=c$$

$$2(3)=b$$
$$6=$$

$$\therefore \boxed{f(x)=3x^2+6x-5}$$

Lesson 5: The Chain Rule

The Chain Rule: Given $y = f(g(x))$ then $y' = f'(g(x))g'(x)$

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Example 1: Differentiate. Do not simplify (Easy examples)

a) $y=\left(4x^2+3x\right)^{11}$

b) $f(x)=\dfrac{1}{5x^2-3x}=(5x^2-3x)^{-1}$

a) $y'=11(4x^2+3x)^{10}\cdot(8x+3)$

b) $y'=-1(5x^2-3x)^{-2}\cdot(10x-3)$

c) $f(x)=\sin(x^2-3x)$ Next unit:)

Example 2: Differentiate. Do not simplify (Combination)

a) $f(x)=\left(\frac{\sqrt[3]{x^2+5}}{\cancel{x}}\right)x^{-1}$

$\frac{1}{3}(x^2+5)^{-2/3}(2x)(x^{-1})+(-x^{-2})\left(\sqrt[3]{x^2+5}\right)$

b) $y=(2x+3)^4(x^2-x)^3$

$y'=4(2x+3)^3(2)(x^2-x)^3+3(x^2-x)^2(2x-1)(2x+3)^4$

c) $y=\left(\frac{t-1}{t+1}\right)^5=\left[(t-1)(t+1)^{-1}\right]^5$

$=(t-1)^5(t+1)^{-5}$

$y'=5(t-1)^4(1)(t+1)^{-5}+-5(t+1)^{-6}\cdot(1)(t-1)^5$