Today's Plan:

Learning Target (standard): I will use algebraic rules to find the derivative of a function.

Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make neccessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuarcy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

p.104 #1-8

1) $f'(x) = 20x + 9$

2) $f'(x) = 18x^2 - 10x + 1$

3) $f'(s) = -20s^3 + 8s - 1$

4) $f'(t) = 24t^5 - 12t^3$

5) $g'(x) = 10x^4 + 9x^2 - 28x$

6) $k'(x) = 36x^2 - 68x + 26$

7) $h'(r) = 18r^5 - 21r^2 + 4r$

8) $g'(s) = 8s^3 + 3s^2 - 20s + 13$

Find the derivative:

$$f(x) = 4x^2 - 6x + 3$$

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

$$= \lim_{h \to 0} \frac{[4(x+h)^2 - 6(x+h) + 3] - [4x^2 - 6x + 3]}{h}$$

$$= \lim_{h \to 0} \frac{4(x^2 + 2xh + h^2) - 6x - 6h + 3 - 4x^2 + 6x - 3}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{4x^2} + 8xh + 4h^2 - \cancel{6x} - 6h + \cancel{3} - \cancel{4x^2} + \cancel{6x} - \cancel{3}}{h}$$

$$= \lim_{h \to 0} \frac{h(8x + 4h - 6)}{h}$$

$$= \lim_{h \to 0} (8x + 4h - 6)$$

$$= 8x + 0 - 6$$

$$f'(x) = 8x - 6$$

Find the derivative:

$$f(x) = 3x^2 - 7x + 2$$

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

$$= \lim_{h \to 0} \frac{[3(x+h)^2 - 7(x+h) + 2] - [3x^2 - 7x + 2]}{h}$$

$$= \lim_{h \to 0} \frac{3(x^2 + 2xh + h^2) - 7x - 7h + 2 - 3x^2 + 7x - 2}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{3x^2} + 6xh + 3h^2 - \cancel{7x} - 7h + \cancel{2} - \cancel{3x^2} + \cancel{7x} - \cancel{2}}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{h}(6x + 3h - 7)}{\cancel{h}}$$

$$= \lim_{h \to 0} (6x + 3h - 7)$$

$$= 6x + 0 - 7$$

$$f'(x) = 6x - 7$$

Find the derivative:

$f(x)=(3x+2)(x-4)$ $f(x)=3x^2-10x-8$

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

$$=\lim_{h\to 0}\frac{[3(x+h)^2-10(x+h)-8]-[3x^2-10x-8]}{h}$$

$$=\lim_{h\to 0}\frac{3(x^2+2xh+h^2)-10x-10h-8-3x^2+10x+8}{h}$$

$$=\lim_{h\to 0}\frac{\cancel{3x^2}+6xh+3h^2-\cancel{10x}-10h-\cancel{8}-\cancel{3x^2}+\cancel{10x}+\cancel{8}}{h}$$

$$=\lim_{h\to 0}\frac{\cancel{h}(6x+3h-10)}{\cancel{h}}$$

$$=\lim_{h\to 0}(6x+3h-10)$$

$$=6x+0-10$$

$$f'(x)=6x-10$$

3) $f(s)=15-s+4s^2-5s^4$

$f'(s)=-20s^3+8s-1$

$f(x)=-7x^6+8x^3-4x+3$

$f'(x)=-42x^5+24x^2-4$

$f(x)=4x^5-6x^3+7x-3$

$f'(x)=20x^4-18x^2+7$

$f(x)=-\frac{1}{2}x^4-3x^2+x+2$

$f'(x)=-2x^3-6x+1$

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

$f'(x)=\frac{3}{2\sqrt{x}}+\frac{2}{3x^{\frac{1}{3}}}$

$f(x)=ax^n$, $a,n\in\mathbb{R}$

$f'(x)=(an)x^{n-1}$

Power Rule

Rules of Thumb:

- The original form of the function dictates the form of the derivative
  - Radicals versus exponents
  - Negative exponents

- Radicals can be left in the denominator unless it is a root of a numerical value

- Cannot leave functions partially factored

$$f'(x) = (x+2)(x-3) + 2(x-3)$$

Rules for Derivatives: Power Rule

$a, n \in \mathbb{R}$

$$f(x) = ax^n$$

$$f'(x) = (an)x^{n-1}$$

Find the derivative:

$$f(x)=2\sqrt{x}+3\sqrt[3]{x^2}-5x+2$$

$$f(x)=2x^{\frac{1}{2}}+3x^{\frac{2}{3}}-5x+2$$

$$f'(x)=x^{-\frac{1}{2}}+2x^{-\frac{1}{3}}-5$$

$$f'(x)=\frac{1}{\sqrt{x}}+\frac{2}{\sqrt[3]{x}}-5$$

Rules for Derivatives: Product Rule

$$f(x)=g(x)\bullet h(x)$$

$$f'(x)=g'(x)\bullet h(x)+g(x)\bullet h'(x)$$

Find the derivative:

$$f(x)=\left(x^3+1\right)\bullet\left(2x^2+8x-5\right)$$

$$f'(x)=3x^2(2x^2+8x-5)+(x^3+1)(4x+8)$$

$$=6x^4+24x^3-15x^2+4x^4+8x^3+4x+8$$

$$f'(x)=10x^4+32x^3-15x^2+4x+8$$

Rules for Derivatives: **Quotient Rule**

$$f(x)=\frac{g(x)}{h(x)}$$

$$f'(x)=\frac{g'(x)\bullet h(x)-g(x)\bullet h'(x)}{\left[h(x)\right]^2}$$

Find the derivative:

$$f(x)=\frac{x+3}{x^2+2x+1}$$

$$f'(x)=\frac{1(x^2+2x+1)-(x+3)(2x+2)}{(x^2+2x+1)^2}$$

$$=\frac{x^2+2x+1-2x^2-2x-6x-6}{(x+1)^4}$$

$$=\frac{-x^2-6x-5}{(x+1)^4}$$

$$=\frac{-1(x^2+6x+5)}{(x+1)^4}$$

$$=-\frac{(x+5)(x+1)}{(x+1)^4}$$

$$f'(x)=-\frac{(x+5)}{(x+1)^3}$$

Assignment:

p.104 #9-12,15,16,19-22,27-29 & 31