

## Homework 2-7

①  $f(x) = 11x^2 - 2x + 9$   
 $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$

$$f(x+h) = 11(x+h)^2 - 2(x+h) + 9$$

$$11(x^2 + 2xh + h^2) - 2x - 2h + 9$$

then:

$$11x^2 + 22xh + 11h^2 - 2x - 2h + 9 - 11x^2 + 2x - 9$$

$$\lim_{h \rightarrow 0} \frac{11h^2 + 22xh - 2h}{h}$$

then  $11h + 22x - 2$  when  $h=0$

$$11h + 22(5) - 2$$

②  $f(x) = 1/(x+1)$

$$f(x+h) = 1/(x+h+1)$$

Eq:  $\frac{(x+1) - (x+h+1)}{(x+1)(x+h+1)} \cdot 1/h$

$x=5: 16(h+16) \rightarrow$   
 $16h + 16(16) = \text{answer!}$

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

Exp:  $\frac{1/x^2 - 1/a^2}{x-a} \approx m = \frac{f(x) - f(a)}{x-a}$

By using the definition of the derivative

⑤  $f(t) = \frac{5t+1}{t+5}; \frac{f'g - g'f}{g^2}$

$$f'(t) = 5; g'(t) = 1$$

$$f(t) = \frac{5(t+5) - (5t+1)}{(t+5)^2} \rightarrow \frac{5t+25-5t-1}{(t+5)^2} = \frac{24}{(t+5)^2}$$

$$f'(t) = 24/(t+5)^2$$

⑦  $f(x) = x^{1/2}; \frac{1}{2}x^{-1/2} \rightarrow \frac{1}{2\sqrt{x}}$   
 at  $(4, 2) = f'(4) = \frac{1}{2\sqrt{4}} = \boxed{\frac{1}{4}}$

$$2 = \frac{1}{4}(4) + b; \boxed{b=1}$$

Eq:  $y = \frac{1}{4}x + 1$

⑧ Analyzing the graph to see if it is increasing or decreasing or constant.

⑨ Predicting the slope on each part of the graph.

⑩ Analyze the graph again; similar to 8, 9.

③  $\frac{f(-1.701) - f(-1.699)}{-1.701 + 1.699} \approx -6.76$

the average velocity question

Continued

$$\textcircled{6} f(x) = \begin{cases} -9x^2 + 2x & ; x < 0 \\ 5x^2 - 2 & ; x \geq 0 \end{cases}$$

$$\lim_{x \rightarrow 0^-} \frac{-9x^2 + 2x + 2}{x} = \text{undefined}$$

$$\lim_{x \rightarrow 0^+} 5x = 0$$

then  $f'(0)$  is undefined!