WARMUP

1) Calculate $f'(3)$ using definition of derivative if $f(x) = \frac{3}{2x}$

$$f'(3) = \lim_{h\to 0} \frac{f(3+h) - f(3)}{h} = \lim_{h\to 0} \frac{\frac{3}{2(3+h)} - \frac{3}{2\cdot 3}}{h}$$

$$= \lim_{h\to 0} \frac{\frac{3}{2(3+h)} - \cancel{\frac{3}{6}}\ \frac{1}{2}}{h} = \lim_{h\to 0} \frac{6 - 2(3+h)}{h\cdot 2(3+h)2} = \lim_{h\to 0} \frac{\cancel{6-6} \overset{-1}{\cancel{-2h}}}{\cancel{h}\cdot\cancel{2}(3+h)2}$$

$$= \frac{-1}{(3+0)2} = -\frac{1}{6}$$

2) Find the equation of the tangent line to $f(x) = \frac{3}{2x}$ when $x = 3$.

SLOPE:

$m = -\frac{1}{6}$

POINT:

$x = 3$

$y = \frac{3}{2x} = \frac{3}{2\cdot 3} = \frac{1}{2}$

$(3, \frac{1}{2})$

EQ:

$y = mx + b$

$\frac{1}{2} = -\frac{1}{6}\cdot 3 + b$

$\frac{1}{2} = -\frac{1}{2} + b$

$1 = b$

$y = -\frac{1}{6}x + 1$

$\boxed{\text{p76-77 } 7, 8, 9, 12, 16, 19, 21}$

$(-1+h)(-1+h)$

$1 - 2h + h^2$

12) $g(t) = 3t^2 + 5t \quad t = -1$

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

$$= \lim_{h \to 0} \frac{\left[3(-1+h)^2 + 5(-1+h)\right] - \overbrace{\left[3(-1)^2 + 5(-1)\right]}^{3 \cdot 1 - 5}}{h}$$

$$= \lim_{h \to 0} \frac{3(1-2h+h^2) - 5 + 5h - (-2)}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{3} - 6h + 3h^2 - \cancel{5} + 5h + \cancel{2}}{h}$$

$$= \lim_{h \to 0} \frac{3h^2 - h}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{h}(3h-1)}{\cancel{h}} = 3 \cdot 0 - 1 = \boxed{-1}$$

16) $f(x) = 5x^2 \ , x = 10$

$$f'(x) = \lim_{h \to 0} \frac{5(10+h)^2 - 5 \cdot 10^2}{h}$$

19) $f(x) = \frac{1}{x^2}$ at $(1,1)$

DISTRIBUTIVE

<u>SLOPE:</u> $f'(1) = \lim_{h \to 0} \frac{\frac{1}{(1+h)^2} - \frac{1}{1^2}}{h} = \lim_{h \to 0} \frac{\left[\frac{1}{(1+h)^2} - 1\right]}{h} \frac{(1+h)^2}{(1+h)^2}$

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

$$= \lim_{h \to 0} \frac{\cancel{1} - \cancel{1} - 2h - h^2}{h(1+h)^2}$$

<u>POINT:</u> $(1,1)$

$$= \lim_{h \to 0} \frac{\cancel{h}(-2-h)}{\cancel{h}(1+h)^2}$$

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