

$$\textcircled{1} \quad \lim_{x \rightarrow -3} \frac{x^2 + 10x + 21}{x^2 - 3x - 18}$$

$$= \lim_{x \rightarrow -3} \frac{(x+3)(x+7)}{(x+3)(x-6)}$$

$$= \lim_{x \rightarrow -3} \frac{x+7}{x-6}$$

$$= \frac{4}{-9} \text{ or } -\frac{4}{9}$$

$$\textcircled{2} \quad m_{\tan} = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$= \lim_{h \rightarrow 0} \frac{1}{h} \left[\frac{2}{x+h} - \frac{2}{x} \right]$$

$$= \lim_{h \rightarrow 0} \frac{1}{h} \left[\frac{2x - 2(x+h)}{x(x+h)} \right]$$

$$= \lim_{h \rightarrow 0} \frac{1}{h} \left[\frac{2x - 2x - 2h}{x(x+h)} \right]$$

$$\begin{aligned}
 &= \lim_{h \rightarrow 0} \frac{-2x}{h \cdot x \cdot (x+h)} \\
 &= \lim_{h \rightarrow 0} \frac{-2}{x(x+h)} \\
 &= \frac{-2}{x^2}
 \end{aligned}$$

③

a) $v = 9t^2 - 4t + 6$ m/s

b) $a = 18t - 4$ m/s²

c) Set $18t - 4 = 0$
 $18t = 4$

$$t = \frac{4}{18} \approx 0.2 \text{ seconds}$$

④

Product Rule $\frac{d}{dx} [uv] = uv' + v u'$

$$\frac{dy}{dx} = (x^9 - x^8 + 2x + 5)(21x^6 + 21x^2) + (3x^7 + 7x^3)(9x^8 - 8x^7 + 2)$$

$$\left. \frac{dy}{dx} \right|_{x=1} = 7(42) + 10(3)$$

$$= 324$$

⑤ Quotient Rule $\frac{d}{dx} \left[\frac{u}{v} \right] = \frac{vu' - uv'}{v^2}$

$$f'(x) = \frac{(x^2+6)(3x^2-11) - (x^3-11x)(2x)}{(x^2+6)^2}$$

$$f'(2) = \frac{10(1) - (-14)(4)}{100} = 0.66$$

⑥ $A = lw$

Sub $l = 8w$: $A = 8w^2$

$$\frac{dA}{dw} = 16w$$