

$$1) \int \frac{3x^2 + 7x + 6}{(x-2)(x^2+4x+4)} dx \quad (x \in (-2, 2))$$

$$\int \frac{3x^2 + 7x + 6}{(x-2)(x^2+4x+4)} dx = \int \left( \frac{A}{\underbrace{(x-2)}_{(x-2)}} + \frac{B}{\underbrace{(x+2)}_{(x+2)}} + \frac{C}{\underbrace{(x+2)^2}_{(x+2)^2}} \right) dx$$

$$3x^2 + 7x + 6 = A(x+2)^2 + B(x-2)(x+2) + C(x-2)$$

$$\text{If } x=2 \Rightarrow 32 = 16A \Rightarrow A=2$$

$$\text{If } x=-2 \Rightarrow 4 = -4C \Rightarrow C=-1$$

$$\text{If } x=0 \Rightarrow 6 = 4 \cdot 2 - 4B + 2 \Rightarrow B=1$$

$$\text{So: } \int_{-2}^2 \frac{2}{x-2} dx + \int_{-2}^2 \frac{1}{x+2} dx + \int_{-2}^2 \frac{-1}{(x+2)^2} dx$$

$$= 2 \left[ \ln|x-2| \right]_{-2}^2 + \left[ \ln|x+2| \right]_{-2}^2 + \left[ \frac{1}{x+2} \right]_{-2}^2$$

$$= \lim_{a \rightarrow 2^+} 2 \left[ \ln|a-2| \right] - 2 \ln 4 + \ln 4 - \lim_{a \rightarrow 2^+} \ln|a+2|$$

$$+ \frac{1}{4} + \lim_{a \rightarrow -2^+} \left( \frac{1}{a+2} \right) = -\ln 4 + \frac{1}{4}$$