⑥ $\int_2^4 \frac{x^2+4x+24}{x^2-4x+8}\,dx$

$$\int \frac{x^2+4x+24}{x^2-4x+8}\,dx = \int \frac{8x+16}{x^2-4x+8}+1\,dx = \int \frac{4(2x+4)+32}{x^2-4x+8}\,dx + \int 1\,dx = 4\int \frac{(2x+4)+32}{x^2-4x+8} + \int 1\,dx$$

$$= 4\int \frac{2x+4}{x^2-4x+8}\,dx + 32\int \frac{1}{x^2-4x+8}\,dx + \int 1\,dx$$

$$= 4\ln|x^2-4x+8| + 32\int \frac{1}{(x-2)^2+4}\,dx + x$$

$$4\ln|x^2-4x+8| + 32\int \frac{1}{u^2+2^2} + x$$

$$4\ln|x^2-4x+8| + \frac{32\arctan\left(\frac{u}{2}\right)}{2} + x$$

$$4\ln|x^2-4x+8| + 16\arctan\left(\frac{x-2}{2}\right) + x$$