

$$1) G(x) = \int_{2x}^{x^3} \frac{dt}{t^3+1} \Rightarrow G'(x) = \frac{3x^2}{x^3+1} - \frac{2}{8x^3+1}$$

$$2) I = \int x^3 (1+x^4)^{1/4} dx \quad u = 1+x^4 \quad du = 4x^3 dx$$

$$= \frac{1}{4} \int u^{1/4} du = \frac{1}{4} \frac{u^{5/4}}{5/4} + C = \frac{1}{5} u^{5/4} + C$$

$$= \frac{1}{5} (1+x^4)^{5/4} + C$$

$$3) y = x^{3x^2} \Rightarrow \ln y = 3x^2 \ln x \Rightarrow \frac{y'}{y} = 3(2x \ln x + x^2 \cdot \frac{1}{x})$$

$$\Rightarrow y' = 3(2x \ln x + x) y = 3x(1+2 \ln x) x^{3x^2}$$

$$4) I = \int \frac{x 2^{x^2}}{3+2^{x^2}} dx \quad u = 3+2^{x^2}$$

$$du = 2^{x^2} 2x \ln 2 dx$$

$$= \frac{1}{2 \ln 2} \int \frac{du}{u} = \frac{1}{2 \ln 2} \ln |u| + C$$

$$= \frac{1}{2 \ln 2} \ln (3+2^{x^2}) + C$$