

Review: Q202-BC PRACTICE Solutions
Q301-AB

$$1. \int \frac{1}{1-x} dx = -\int \frac{1}{u} du = -\ln|u| + C = -\ln|1-x| + C$$

$$u = 1-x$$

$$du = -dx$$

$$dx = -du$$

$$2. \int \sin^2 x \cos x dx = \int u^2 du = \frac{u^3}{3} + C = \frac{\sin^3 x}{3} + C$$

$$u = \sin x$$

$$du = \cos x dx$$

$$dx = \frac{du}{\cos x}$$

$$3. \int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx = 2 \int e^u du = 2e^u + C = 2e^{\sqrt{x}} + C$$

$$u = \sqrt{x}$$

$$du = \frac{1}{2\sqrt{x}} dx$$

$$dx = 2\sqrt{x} du$$

$$4. \int \frac{1}{1+3x^2} dx = \int \frac{1}{1+(\sqrt{3}x)^2} dx = \frac{1}{\sqrt{3}} \int \frac{1}{1+u^2} du = \frac{1}{\sqrt{3}} \tan^{-1} u + C$$

$$u = \sqrt{3}x$$

$$du = \sqrt{3} dx$$

$$dx = \frac{du}{\sqrt{3}}$$

$$= \frac{1}{\sqrt{3}} \tan^{-1}(\sqrt{3}x) + C$$

$$5. \int x(1+x^3) dx = \int (x + x^4) dx = \frac{x^2}{2} + \frac{x^5}{5} + C \quad \therefore$$

u -sub does not work!

When in a JAM - EXPAND!

$$6. \int x(2-x^2)^3 dx = -\frac{1}{2} \int u^3 du = -\frac{1}{2} \frac{u^4}{4} + C = -\frac{1}{8} (2-x^2)^4 + C$$

$$u = 2-x^2$$

$$du = -2x dx$$

$$dx = \frac{du}{-2x}$$

$$7. \int \frac{x^2}{x^3+1} dx = \frac{1}{3} \int \frac{1}{u} du = \frac{1}{3} \ln|u| + C = \frac{1}{3} \ln|x^3+1| + C$$

$$u = x^3 + 1$$

$$du = 3x^2 dx$$

$$dx = \frac{du}{3x^2}$$

$$8. \int \frac{x^2}{\sqrt{x^3+1}} dx = \frac{1}{3} \int u^{-1/2} du = \frac{1}{3} \cdot \frac{2}{1} u^{1/2} = \frac{2}{3} (x^3+1)^{1/2} + C$$

$$u = x^3 + 1$$

$$du = 3x^2 dx$$

$$dx = \frac{du}{3x^2}$$

$$9. \int \frac{\sin(\frac{3}{x})}{x^2} dx = -\frac{1}{3} \int \sin(u) du = +\frac{1}{3} \cos(u) + C$$

$$u = \frac{3}{x}$$

$$du = -\frac{3}{x^2} dx$$

$$dx = \frac{du x^2}{-3}$$

$$= \frac{1}{3} \cos(\frac{3}{x}) + C$$

$$10. \int \frac{1}{\sqrt{9-x^2}} dx = \int \frac{1}{\sqrt{9} \sqrt{1-\frac{x^2}{9}}} dx = \int \frac{1}{3 \sqrt{1-(\frac{x}{3})^2}} dx$$

$$= \frac{1}{3} \int \frac{dx}{\sqrt{1-(\frac{x}{3})^2}} = \frac{1}{3} \cdot 3 \int \frac{1}{\sqrt{1-u^2}} du$$

$$u = \frac{x}{3}$$

$$du = \frac{dx}{3}$$

$$dx = 3 du$$

$$= \sin^{-1} u + C$$

$$= \sin^{-1}(\frac{x}{3}) + C$$

$$11. \int \frac{d}{dx} \left(x^3 \sqrt{x-4} \right) dx = x^3 \sqrt{x-4}$$

Cancel out