

Math 21B
Kouba
Integration Techniques

1.) Direct use of formula :

$$\int \frac{4}{x} dx, \int 3^x dx, \int (\sec x + \csc^2 x) dx,$$

2.) Algebraic manipulation, then integration :

$$\int (x+3)^2 x^5 dx, \int \frac{3x^3 - 2x + 5}{x+3} dx, \int \sec x (\sec x + \tan x) dx$$

3.) U-substitution :

$$\int \tan^3 x \sec^2 x dx, \int \frac{2^{-x}}{5 + 2^{-x}} dx, \int (x+3)(2x^2 + 12x - 9)^6 dx$$

4.) U-substitution, then back substitute :

$$\int (x+1)\sqrt{x+2} dx, \int \frac{x^2}{(3x-5)^3} dx, \int x^3 \sqrt{x^2+5} dx$$

5.) Integration by parts :

$$\int x \sin x dx, \int x (\ln x)^3 dx, \int e^x \cos x dx$$

6.) Logarithm/arctangent problems :

$$\int \frac{37x}{4+3x^2} dx, \int \frac{1}{4+3x^2} dx, \int \frac{x-5}{x^2+6x+20} dx$$

7.) Partial fractions :

$$\int \frac{8}{16-x^2} dx, \int \frac{x^2}{(x-2)^3(x^2+9)} dx, \int \frac{x^3-2x+3}{x^3-1} dx$$

8.) Trig integrals (manipulation of powers or use of identities, then integration):

$$\int \sin^2 x dx, \int \sec^6 3x \tan 3x dx, \int \sec^6 x \tan^4 x dx$$

9.) Power u-substitution :

$$\int \sqrt{1+\sqrt{x}} dx, \int \frac{\sqrt{x}}{7-\sqrt{x}} dx, \int \frac{(x-1)^{\frac{1}{3}}}{x} dx$$

10.) Trig substitution :

$$\int \sqrt{4-9x^2} dx, \int \frac{4}{\sqrt{x^2-1}} dx, \int \frac{\sqrt{9+x^2}}{x} dx$$