

1. Integration of Rational Functions: $\int \frac{dx}{x^2+1} = \tan^{-1}x + C$
 (i) $\int \frac{dx}{x^2+1} = \tan^{-1}x + C$
 (ii) $\int \frac{dx}{x^2+4} = \frac{1}{2} \tan^{-1} \frac{x}{2} + C$
 (iii) $\int \frac{dx}{x^2+9} = \frac{1}{3} \tan^{-1} \frac{x}{3} + C$
2. Q1: Evaluate $\int \frac{dx}{\sqrt{16-(x+3)^2}}$
 $= \int \frac{dx}{\sqrt{16-(x+3)^2}} = \sin^{-1} \left(\frac{x+3}{4} \right) + C$
 Q2: Evaluate $\int \frac{\sec^2 x dx}{\sqrt{\tan^2 x + 4}}$
3. At $\tan x = t$
 $\sec^2 x dx = dt$
 $\int \frac{dt}{t^2+1} = \tan^{-1} t + C$
 $= \tan^{-1} \left(\frac{x+3}{4} \right) + C$
 Q1: Evaluate $\int \frac{dx}{\sqrt{16-(x+3)^2}}$
 Let $2-x = t$; $-dx = dt$
4. $I = \int \frac{dx}{x^2+1} = -\log |t + \sqrt{t^2+1}| + C$
 $= -\log |(x+3) + \sqrt{(x+3)^2+1}| + C$
 $= \log \left| \frac{1}{(x+3) + \sqrt{(x+3)^2+1}} \right| + C$
 Q1: Evaluate $\int \frac{dx}{\sqrt{16-(x+3)^2}}$
5. $I = \int \frac{dx}{x^2+1} = \tan^{-1} x + C$
 $= \tan^{-1} \left(\frac{x+3}{4} \right) + C$
 Q1: Evaluate $\int \frac{dx}{\sqrt{16-(x+3)^2}}$
6. Q1: Evaluate $\int \frac{dx}{\sqrt{16-(x+3)^2}}$
 Q2: Evaluate $\int \frac{\sec^2 x dx}{\sqrt{\tan^2 x + 4}}$
 Q3: Evaluate $\int \frac{dx}{\sqrt{16-(x+3)^2}}$

Q1: Evaluate $\int \frac{dx}{\sqrt{7-6x-x^2}}$

$7-6x-x^2+9-9$
 $16-(x+3)^2$

$= \int \frac{dx}{\sqrt{16-(x+3)^2}}$

$= \sin^{-1} \left(\frac{x+3}{4} \right) + C$

Q2: Evaluate $\int \frac{\sec^2 x dx}{\sqrt{\tan^2 x + 4}}$

$\int \frac{dx}{\sqrt{a^2-x^2}} = \sin^{-1} \frac{x}{a} + C$

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1 Integration of Rational Functions: $\int \frac{dx}{x^2+4}$

(1) $\int \frac{dx}{x^2+4} = \arctan\left(\frac{x}{2}\right) + C$

(2) $\int \frac{dx}{x^2+4} = \log|x + \sqrt{x^2+4}| + C$

(3) $\int \frac{dx}{x^2+4} = \log|x + \sqrt{x^2+4}| + C$

2 Q1: Evaluate $\int \frac{dx}{x^2+4}$

$\int \frac{dx}{x^2+4} = \int \frac{dx}{4\left(\frac{x^2}{4}+1\right)} = \frac{1}{4} \int \frac{dx}{\left(\frac{x}{2}\right)^2+1}$

$= \frac{1}{4} \arctan\left(\frac{x}{2}\right) + C$

Q2: Evaluate $\int \frac{dx}{x^2+4}$

Let $2-x = t$; $-dx = dt$

3 Let $\tan x = t$

$\sec^2 x dx = dt$

$\int \frac{dt}{t^2+4} = \log|t + \sqrt{t^2+4}| + C$

$= \log|\tan x + \sqrt{\tan^2 x + 4}| + C$

4 $I = \int \frac{dx}{x^2+4} = -\log|t + \sqrt{t^2+4}| + C$

$= -\log|(2-x) + \sqrt{(2-x)^2+4}| + C$

$= \log\left|\frac{1}{(2-x) + \sqrt{(2-x)^2+4}}\right| + C$

Q1: Evaluate $\int \frac{dx}{\sqrt{4-x^2}}$

5 $I = \int \frac{dx}{\sqrt{4-x^2}}$

$= \int \frac{dx}{\sqrt{(2)^2 - x^2}}$

$= \arcsin\left(\frac{x}{2}\right) + C$

6 Q1: $\int \frac{dx}{\sqrt{4-x^2}}$

Q2: $\int \frac{dx}{\sqrt{4-x^2}}$

Q3: $\int \frac{dx}{\sqrt{4-x^2}}$

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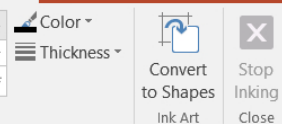
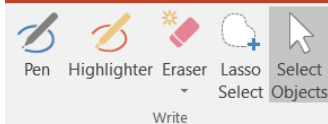
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8-7-2015
Integration of Rational Functions: $\int \frac{dx}{f(x)}$

(1) $\int \frac{dx}{x^2+1} = \arctan\left(\frac{x}{1}\right) + C$

(2) $\int \frac{dx}{x^2-1} = \log\left|\frac{x-1}{x+1}\right| + C$

(3) $\int \frac{dx}{x^2+4} = \frac{1}{2} \arctan\left(\frac{x}{2}\right) + C$

Q1: Evaluate $\int \frac{dx}{x^2-1}$

$\int \frac{dx}{x^2-1} = \int \frac{1}{(x-1)(x+1)} dx$

$= \int \frac{A}{x-1} + \frac{B}{x+1} dx$

$= \arctan\left(\frac{x}{1}\right) + C$

Q2: Evaluate $\int \frac{dx}{x^2+4}$

$\int \frac{dx}{x^2+4} = \frac{1}{2} \arctan\left(\frac{x}{2}\right) + C$

Q3: Evaluate $\int \frac{dx}{x^2+1}$

$\int \frac{dx}{x^2+1} = \arctan\left(\frac{x}{1}\right) + C$

Q4: Evaluate $\int \frac{dx}{x^2-1}$

$\int \frac{dx}{x^2-1} = \log\left|\frac{x-1}{x+1}\right| + C$

Q5: Evaluate $\int \frac{dx}{x^2+4}$

$\int \frac{dx}{x^2+4} = \frac{1}{2} \arctan\left(\frac{x}{2}\right) + C$

Q6: Evaluate $\int \frac{dx}{x^2+1}$

$\int \frac{dx}{x^2+1} = \arctan\left(\frac{x}{1}\right) + C$

$$I = \int \frac{dt}{\sqrt{t^2+1}} = -\log\left|t + \sqrt{t^2+1}\right| + C$$

$$= -\log\left|(2-x) + \sqrt{(2-x)^2+1}\right| + C$$

$$= \log\left|\frac{1}{(2-x) + \sqrt{(2-x)^2+1}}\right| + C$$

Q4: Evaluate: $\int \frac{dx}{\sqrt{(x-1)(x-2)}}$

$$I = \int \frac{dx}{\sqrt{x^2 - 3x + 2}}$$

$$= \int \frac{dx}{\sqrt{\left(x - \frac{3}{2}\right)^2 - \left(\frac{1}{2}\right)^2}}$$

$$= \log \left| \left(x - \frac{3}{2}\right) + \sqrt{\left(x - \frac{3}{2}\right)^2 - \frac{1}{4}} \right| + C$$

$$\text{let } x - \frac{3}{2} = t \\ dx = dt$$

$$\left(\frac{3}{2}\right)^2 = \frac{9}{4}$$

$$x^2 - 3x + \frac{9}{4} - \frac{9}{4} + 2$$

$$\left(x - \frac{3}{2}\right)^2 + 2 - \frac{9}{4}$$



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