$$\int \frac{1}{x^2+2x+5}\,dx$$

$x+1 = 2\tan\theta \longrightarrow \frac{x+1}{2} = \tan\theta$

$dx = 2\sec^2\theta\,d\theta$

$$\int \frac{dx}{x^2+2x+1+5-1}$$

$$\int \frac{1}{(x+1)^2+4}\,dx$$

$$\int \frac{1}{4\tan^2\theta+4}\cdot 2\sec^2\theta\,d\theta$$

$$\int \frac{1}{4(1+\tan^2\theta)}\cdot 2\sec^2\theta\,d\theta$$

$$\int \frac{1}{2}\,d\theta$$

$$\frac{1}{2}\theta + C$$

$$\boxed{\frac{1}{2}\tan^{-1}\left(\frac{x+1}{2}\right)+C}$$

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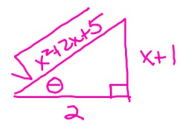
$$\int \frac{x}{x^2+2x+5}\,dx$$

$x+1 = 2\tan\theta \longrightarrow \frac{x+1}{2} = \tan\theta$

$dx = 2\sec^2\theta\,d\theta$



$$\int \frac{x}{(x+1)^2+4}\,dx$$

$$\int \frac{2\tan\theta-1}{4\tan^2\theta+4}\cdot 2\sec^2\theta\,d\theta$$

$$\int \frac{2\tan\theta-1}{4(\tan^2\theta+1)}\cdot 2\sec^2\theta\,d\theta$$

$$\frac{1}{2}\int 2\tan\theta - 1\,d\theta$$

$$-\ln|\cos\theta| - \frac{1}{2}\theta + C$$

$$\boxed{-\ln\left|\frac{2}{\sqrt{x^2+2x+5}}\right| - \frac{1}{2}\tan^{-1}\left(\frac{x+1}{2}\right)+C}$$

$$\ln\left|\frac{\sqrt{x^2+2x+5}}{2}\right| - \frac{1}{2}\tan^{-1}\left(\frac{x+1}{2}\right)+C$$

$$\frac{1}{2}\ln\left|x^2+2x+5\right| - \frac{1}{2}\tan^{-1}\left(\frac{x+1}{2}\right)+C$$

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

$x-1 = \sin\theta$

$dx = \cos\theta\,d\theta$

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

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

$$\int \frac{\cos\theta\,d\theta}{\sqrt{1-\sin^2\theta}}$$

$$\int d\theta$$

$$= \theta + C$$

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

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NOTES

Ex: $3x^2+6x+7$

$3(x^2+2x+1)+7-3$

$3(x+1)^2+4$

$$\int \frac{1}{3x^2+6x+7}\,dx$$

$$\int \frac{dx}{3(x+1)^2+4}$$

USE $x+1 = \frac{2}{\sqrt{3}}\tan\theta$

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