$$\int arctanx\, dx =$$

Use integration by parts:

$$\int u \cdot \frac{dv}{dx}\, dx \;=\; uv \;-\; \int v \cdot \frac{du}{dx}\, dx$$

$u = \arctan x$ $\qquad \frac{dv}{dx} = 1$

$\frac{du}{dx} = \frac{1}{1+x^2}$ $\qquad v = x$

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

$$= x \arctan x - \int \frac{x}{1+x^2}\, dx$$

Use integration by recognition:

$$\int \frac{f'(x)}{f(x)}\, dx \;=\; ln|f(x)| \; + C$$

$$= x \arctan x - \frac{1}{2}\int \frac{2x}{1+x^2}\, dx$$

$$= x \arctan x - \frac{1}{2} \ln|1+x^2| + C$$