Integrating with inverse trigonometric functions

Use an appropriate substitution to show that $\int \frac{1}{1+x^2}\,dx = \arctan x + C$

> Think what value of x would make $1 + x^2$ nicely simplify.

Dealing with $1/(a^2 - x^2)$, $1/\sqrt{a^2 - x^2}$, ….

Use our previous results to fill in the table below:

$\int \frac{1}{\sqrt{1-x^2}}\,dx =$	$\lvert x\rvert < a$
$\int \frac{1}{1+x^2}\,dx =$	

Show that $\int \frac{1}{\sqrt{a^2-x^2}}\,dx = \arcsin\left(\frac{x}{a}\right) + c$ where a is a positive constant and $\lvert x\rvert < a$.

We can extend these results to give some standard results which are given in the formulae book:

$$\int \frac{1}{\sqrt{a^2 - x^2}}\, dx = \arcsin\left(\frac{x}{a}\right) + C, \quad |x| < a$$

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

1. Find $\int \frac{4}{5+x^2} dx$

2. Find $\int \frac{1}{25+9x^2} dx$

3. Find $\int_{-\frac{\sqrt{3}}{4}}^{\frac{\sqrt{3}}{4}} \frac{1}{\sqrt{3-4x^2}}\,dx$

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

Ex 3D Pg 67-68