

# TECHNIQUES OF INTEGRATION

## 0. Just do it

For when you just know the answer

- Know your derivatives
- Divide by constant derivative

## 1. Rewrite it

For when a little work would make it easier

- Expand brackets
- Simplify
- Use a trig identity
- Make your own trig identity

## 2. Substitution

For when it might be easier if one thing was replaced by something else

- Find the most annoying bit
- Look for a derivative
- Work the substitution
- May need to rewrite

## 3. By parts

For products of two functions

- Integrate what you can
- Aim to make it simpler
- May need it more than once
- Try "1 times ..."
- Go round in circles

## 7. Do it numerically

For when it's too hard to do it algebraically

- One-point rules: left, right, midpoint
- Trapezoidal rule
- Simpson's rule

## 6. Partial fractions

For rewriting polynomials over polynomials

- Polynomial division
- Splitting denominator
- Completing the square

## 5. Trig substitution

For powers and roots of pythagoras-ish expressions

- Use trig identity to decide which one
- Work the substitution to put it in
- Work the substitution to get x back

## 4. Reduction formula

For big powers that will take lots of by parts

Making them:

- Watch for the original
- Will have to rewrite or go round in circles

Using them:

- Start from the bottom
- Try a definite integral formula

