

Calculating sines for ourselves using the famous expansion:

$$\sin(x) = + \frac{x^1}{1!} - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \frac{x^9}{9!} - \frac{x^{11}}{11!} + \frac{x^{13}}{13!} \dots$$

Recognising that it is just lots of terms all with the same form, a plus or minus, an X to the power of N, and an N factorial, we'll tackle each separately.

```
int plusminus(const int n)
{ const int vals[] = { 0, 1, 0, -1 };
  return vals[n%4];}

double power(const double x, const int n)
{ double p = 1;
  int i = 1;
  while (i<=n)
  { p = p*x;
    i = i+1; }
  return p; }

int factorial(const int n)
{ int f = 1, i = 1;
  while (i<=n)
  { f = f*i;
    i = i+1; }
  return f; }

double sineterm(const int n, const double x)
{ return plusminus(n) * power(x,n) / factorial(n); }

double sine(const double x, const int numterms)
{ double s = 0;
  int t = 1;
  while (t <= numterms)
  { s = s + sineterm(t, x);
    t = t+2; }
  return s; }
```

Now we just need a good way of testing and examining it.