

Part V
Mathematics & C

"Standing alone needs courage"
- **Ramesh Krishnan**

“Blessed are the meek.”

54 Implementing Math Functions

For a quite long time, I was wondering how to implement mathematic functions like `sin()`, `cos()`, `log()` etc. I knew the implementation of the easy functions like `IntegerPower()`:

```
int IntegerPower(int a, int n)
{
    int i, result=1;
    for ( i=0; i<n; ++i )
        result *= a;
    return( result );
}
```

But how to implement the functions like `sin()`, `cos()`? Let's see!

54.1 Range reduction and Chebychev polynomial approximation

The range reduction uses various transformation formulas to reduce the range of the input argument. For trigonometric functions, the reduction is to the first quadrant or even a part of the first quadrant. Then a polynomial providing the best accuracy within that limited range is used. But outside that limited range, the accuracy of the polynomial worsens very quickly. This method is widely used on computers with floating-point hardware.

54.2 CORDIC Method

The CORDIC (COordinate Rotation DIgital Computer) methods are sometimes described as a 'pseudo-division'. That is, like in normal division we subtract a divisor repeatedly, but unlike normal division this divisor changes value between each subtraction according to a set of rules. This method is usually used in pocket calculators that don't have floating-point hardware. You can turn to Algorithms section of this book for more explanations about CORDIC Algorithm!