# CO523 Lab 3

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April 7, 2015

1. Write a function to compute the cross product of two 3-dimensional vectors. Use tuples to represent vectors.

2. Write the Ackermann function using a match expression. Assume the two arguments non-negative.

$$A(m,n) = \begin{cases} n+1 & m = 0 \\ A(m-1, 1) & m > 0 \text{ and } n = 0 \\ A(m-1, A(m, n-1)) & m > 0 \text{ and } n > 0 \end{cases}$$

3. Write a function to print which quadrant an (x, y) coordinate belongs to. Assume that a coordinate lying on an axis belongs to the anticlockwise next quadrant.
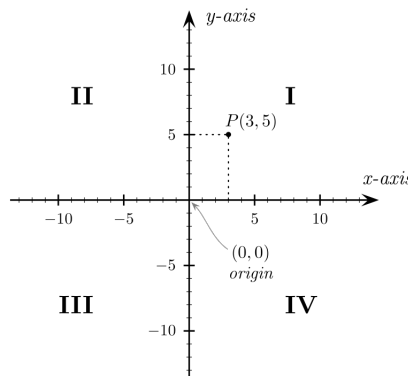
Hint: This cannot be done directly using match expressions. First write a `sign` function that returns $-1, 0, 1$ depending whether the number is positive, zero or negative.

4. Write a function to test whether a given complex number belongs to the Mandelbrot set. If c belongs to the Mandelbrot set, the value of $|z_n|$ remains bounded when applying the following recurrence, beginning with $z_0 = 0$.

$$z_{n+1} = z_n^2 + c$$