# Object-Oriented Programming, List 3

Due: 7 April 2009

1. You have seen how to implement the Taylor sequence for the function $e^x$ in the lecture. Implement the Taylor sequence for $\sin(x)$. It is defined by

$$\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \frac{x^9}{9!} - \cdots.$$

   Write a program that asks for a number, and prints its sine. If you want to accept input in degrees, you will have to multiply it by $\pi/180$ first.

2. $$\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \cdots.$$

   Write a program that approximates $\frac{\pi}{4}$ through this sequence. (Note. The sequence has a very bad convergence rate. Be patient.)

3. The tangent function $\tan(x) = \frac{\sin(x)}{\cos(x)}$ has no nice Taylor sequence, but it has a nice continued fraction:

```
                    x
tan x = ------------------------------
                          x^2
          1 - ------------------------
                            x^2
              3 - ------------------
                              x^2
                  5 - --------------
                                x^2
                      7 - ----------
                                  x^2
                          9 - --------
                              11 - ...
```

   Write a program that asks for an angle (in radians), and which prints the tangent of this angle.

   Don't worry too much about efficiency. Start the fraction with some large number.