Solutions (Part II) Lab-session 3

1) a) Sub Nint()

```
a = 1            (** Change here lower limit **)
b = 4            (** Change here the upper limit **)
n = 10000        (** Change here the amount of subdivisions **)
h = (b - a) / n
I = h * (f(a) + f(b)) / 2
For m = 2 To n
    I = I + f(a + h * (m - 1)) * h
Next
Range("B3").Value = I
End Sub
Function f(x)
   f =          (** Type here the function to be integrated, e.g. 1 / x, etc **)
End Function
```

$$\begin{aligned} I_1 &\approx 1.38629436112, \\ I_1^{(n=10)} &= 1.393261 \quad I_1^{(n=100)} = 1.386365 \quad I_1^{(n=1000)} = 1.38629506 \quad I_1^{(n=10000)} = 1.386294368 \end{aligned}$$

$$\begin{aligned} I_2 &\approx 3.059116539645953, \\ I_2^{(n=10)} &= 3.06066 \quad I_2^{(n=100)} = 3.05913193 \quad I_2^{(n=1000)} = 3.0591167 \quad I_2^{(n=10000)} = 3.059116541 \end{aligned}$$

$$\begin{aligned} I_3 &\approx 12.156720758761058, \\ I_3^{(n=10)} &= 11.90205 \quad I_3^{(n=100)} = 12.154171 \quad I_3^{(n=1000)} = 12.1566953 \quad I_3^{(n=10000)} = 12.1567205 \end{aligned}$$

Shift x by 5 and then take for instance a=-5 and b=5 as a reasonable cut-offs.

$$\begin{aligned} I_4 &\approx 1.7724538509055159, \\ I_4^{(n=10)} &= 1.77264 \quad I_4^{(n=100)} = 1.772453851 \quad I_4^{(n=1000)} = 1.772453851 \quad I_4^{(n=10000)} = 1.772453851 \end{aligned}$$

b) Function Nintf(a, b, n)

```
h = (b - a) / n
I = 0
For m = 1 To n - 1 Step 2
        I = I + (f(a + h * (m - 1)) + 4 * f(a + h * m) + f(a + h * (m + 1)))
Next
Nintf = I * h / 3
End Function
```

$$I_1^{(n=100)} = 1.386294, \quad I_2^{(n=100)} = 3.059117, \quad I_3^{(n=100)} = 12.156721, \quad I_4^{(n=10)} = 1.772454$$

2)

$$110x^2 + 1650x - 40040 = 0$$

Solutions: $x_1 = -28$ and $x_2 = 13$. For instance a start value 0 gives $x_2 = 13$ with a precision $2.51E-08$ and a start value -20 gives $x_1 = -28$ with a precision of 0.000169.

$$x^3 - 17x^2 + 71x - 55 = 0$$

Solutions: $x_1 = 1$, $x_2 = 5$ and $x_2 = 11$. For instance a start value 0 gives $x_1 = 1$ with a precision $-6.9E-06$, the start value 8 gives $x_2 = 5$ with a precision of $-5.9E-05$ and a start value 20 gives $x_3 = 20$ with a precision $1.29E-05$.