# Tutorial 1

1. Suppose two points $(x_0, y_0)$ and $(x_1, y_1)$ are on a straight line with $y_1 \neq y_0$. The $x$-intercept of this line is given by the formula

$$x = \frac{x_0 y_1 - x_1 y_0}{y_1 - y_0} \qquad (a)$$

Equation (a) can be rewritten as

$$x = x_0 - \frac{(x_1 - x_0) y_0}{y_1 - y_0} \qquad (b)$$

Use the data $(x_0, y_0) = (1.31, 3.24)$ and $(x_1, y_1) = (1.93, 4.76)$ to compute the x-intercept by equation (a) and (b) (use SCI-4).

Which formula gives better result and why?

(2) Let $f : [a,b] \to \mathbb{R}$ be a continuous function and let $g \geq 0$ be an integrable function on $[a,b]$.

Show that

$$\int_a^b f(x) g(x)\, dx = f(\xi) \int_a^b g(x)\, dx$$

for some $\xi \in [a,b]$

(3)

| $x$ | $f(x)$ |
|---|---|
| 0 | 1 |
| 0.6 | 8.253 E-1 |
| 0.9 | 6.216E-1 |

Use Lagrange form of interpolating polynomial to approximate $f(0.4)$ and $f(0.7)$

4)

| $x$ | $f(x)$ |
| --- | --- |
| 0 | 0 |
| 0.2 | 1.823 E-1 |
| 0.4 | 3.365 E-1 |
| 0.6 | 4.7 E-1 |

Use Newtons divided difference formula to find $P_2(x)$ and $P_3(x)$.
Approximate $f(0.3)$
$f(0.5)$
using $P_2(x)$ and $P_3(x)$

5) Prove that the $k^{th}$ divided difference $p[x_0, \ldots, x_k]$ of a polynomial of degree $\leq k$ is independent of the interpolation pts $x_0, x_1, \ldots, x_k$.