Assignment 1.0: Reminder: Course Policies (0 Points)

This course has established some policies regarding issues such as plagiarism, missed assignments and midterms etc. These policies can be found on the web page

http://www.ugrad.cs.ubc.ca/~cs424/policies.html

Please read this web page, sign the statement on the web page

http://www.ugrad.cs.ubc.ca/~cs424/plag.html

and return the signed sheet together with your assignment solution.

Note: Your assignments will not be marked if we do not receive the signed statement from you.

Assignment 1.1: Curve Representation: line (9 Points)

Given two points, \( P_0 = (2, 2), P_1 = (4.5, 3) \).

a) Find the implicit equation of an infinite straight line going through \( \{P_0, P_1\} \).

b) Convert the implicit equation in a) to explicit form, if it’s possible. Show your work. If it’s not possible to convert, explain your reasons.
c) Find the parametric equation for the straight line passing through these two points.

Assignment 1.2: Curve Representation: ellipse (9 Points)

Given an ellipse with the center at the origin $O(0,0)$, a semi-major axis $a$ and a semi-minor axis $b$ (see Figure 2).

![Figure 1: The ellipse with the center at the origin, a semi-major axis $a$ and a semi-minor axis $b$.](image)

a) Find the implicit equation of the given ellipse. Show your work.
b) Convert the *implicit* equation in a) to *explicit* form, if it’s possible. Show your work. If it’s not possible to convert, show your reason.

c) Find the parametric form of the given ellipse.

**Assignment 1.3: Lagrange Polynomial (10 Points)**

Given a set of \( k + 1 \) points \((t_0, x_0), (t_1, x_1), \ldots, (t_k, x_k)\), we can use the following polynomial function \( F(t) \) of degree up to \( k \) to interpolate them:

\[
F(t) = \sum_{i=0}^{k} L_i(t) \cdot x_i,
\]

(1)

and

\[
L_i(t) = \prod_{0 \leq m \leq k, m \neq i} \frac{t - t_m}{t_i - t_m}.
\]

(2)
a) Given two points:
   - \( t_0 = 1, x_0 = 1 \),
   - \( t_1 = 2, x_1 = 8 \),

write down the interpolating polynomial. Show your work.

b) Given three points:
   - \( t_0 = 1, x_0 = 1 \),
   - \( t_1 = 2, x_1 = 8 \),
   - \( t_2 = 4, x_2 = 64 \),

write down the interpolating polynomial. Show your work.