Each question is worth 2 points. Write legibly. In your solutions, use points and vectors and the functions and operators discussed in the reading material and in class, such as n(), U(), V(), R(), +,-,* ... or their mathematical equivalents.

1) Provide a “valid” expression for the point P at one third from A towards B?
\[ A + \frac{AB}{3} \]

2) Explain the terms “normal” and “norm” and give an example of their use in proper context?

*The normal to a line is a direction orthogonal to it. A vector is normal to a line if it is orthogonal to it. The norm of a vector is its length.*

3) Let <1,2> and <4,3> be two vectors. What is their dot-product?
\[ 4 + 6 = 10 \]

4) Provide the pseudo-code or geometric construction for testing whether the polygonal path \{A,B,C\} makes a right turn at B.

\[
dot(R(V(A,B)), V(A,C)) > 0. \text{ Also acceptable } R(AB) \cdot AC > 0 \text{ or } R(AB) \cdot BC > 0 \ldots
\]

5) You are given two frames \([O_1,I_1,J_1]\) and \([O_2,I_2,J_2]\) and the local coordinates \((x_1,y_1)\) of a point P in \([O_1,I_1,J_1]\). Provide the construction or expression for the local coordinates \((x_2,y_2)\) of P in \([O_2,I_2,J_2]\).

\[
P = O_1 + x_1 I_1 + y_1 J_1; \ x_2 = O_2 P \cdot I_2; \ y_2 = O_2 P \cdot J_2;
\]

6) Write a simple algorithm for computing the sum of the two largest values in an array A of n integers. Your algorithm does not need to be efficient. You may not use a call to sort the array. (For extra credit, if needed.)

\[
\text{float } s = A[0] + A[1]; \text{ for (int } i=0; \ i<n-1; \ i++) \text{ for (int } j=i+1; \ j<n; \ j++) \text{ } s = \text{max}(s, A[i] + A[j]);
\]