

Introduction to Maple

Problem 1. Please use Maple to complete each of the following problems.

- (a) Compute the (i) exact value AND (ii) a decimal approximation to the 6 places of $\sin(\pi/12)$.
- (b) Fully expand $\frac{(2x+1)^5}{4}$.
- (c) Sketch the graph of $f(x) = x \sin\left(\frac{1}{x}\right)$. Make sure that you choose the domain in such a way that the characteristics of the function around $x = 0$ are clearly displayed.

Section 12.4: The Cross Product

Problem 2. Let $\mathbf{a} = \mathbf{i} + 2\mathbf{j} - 3\mathbf{k}$ and $\mathbf{b} = -\mathbf{i} + 2\mathbf{j} + 5\mathbf{k}$. Determine each of the following **by hand**:

- (a) $\mathbf{a} \times \mathbf{b}$, (b) two unit vectors that are both orthogonal to \mathbf{a} and \mathbf{b} ,
(c) the angle θ between \mathbf{a} and \mathbf{b} , (d) $|\mathbf{a} \times \mathbf{b}|$.

Problem 3. Use Maple to obtain the solutions for all parts of Problem 2.

Problem 4.

(a) Find a nonzero vector orthogonal to the plane through the points $P = (-2, 0, 4)$, $Q = (1, 3, -2)$, and $R = (0, 3, 5)$.

(b) Find the area of the triangle PQR .

Problem 5. Use the scalar triple product to verify that the vectors $\mathbf{a} = \langle 1, 5, -2 \rangle$, $\mathbf{b} = \langle 3, -1, 0 \rangle$, and $\mathbf{c} = \langle 5, 9, -4 \rangle$ are coplanar.