

## CS 355 Homework #2: More With Points, Vectors, and Lines

1. A line passes through the points  $\mathbf{p}_1 = (10, 20)$  and  $\mathbf{p}_2 = (30, 40)$ .
  - (a) Express this line in parametric form as described in Section 9.2.1 of your book.
  - (b) Express the line in implicit form as described in Section 9.2.2 of your book.
  - (c) How close is the point  $\mathbf{q} = (22, 29)$  from the line? (You may use either the implicit or parametric form of the line to do this.)
  - (d) Does the closest point on the line to the point  $\mathbf{q} = (22, 29)$  fall within the endpoints of this line segment?
2. A circle has center at  $\mathbf{c} = (10, 12)$  and radius  $r = 3$ .
  - (a) Show mathematically whether the point  $\mathbf{q} = (12, 13)$  is within the circle.
  - (b) What point on the circle is closest to the point  $\mathbf{q} = (20, 15)$ ?
3. An ellipse has center at  $\mathbf{c} = (10, 12)$  with width 20 and height 10.
  - (a) Show mathematically whether the point  $\mathbf{q} = (19, 13)$  is within the ellipse.
  - (b) What are the corners of the bounding box for this shape?
4. A square with length 10 on each side is centered at position  $\mathbf{c} = (60, 80)$ . Show mathematically the steps you would do to determine whether the point  $\mathbf{q} = (64, 74)$  is within the square.
5. A triangle has corners at  $p_1 = (10, 20)$ ,  $p_2 = (30, 40)$ ,  $p_3 = (20, 50)$ . Show mathematically whether the point  $q = (20, 40)$  is within the triangle.