Rotating a point Answers

1. Consider any point (x, y). Graph it to the right.

2. Write this point in terms of its distance from (r∙cos(k+θ)°, r∙sin(k+θ)°)

 the origin (r) and the standard position angle it

 makes with the positive x axis (k°). (x, y) (r∙cos k°, r∙sin k°)

3. Rotate this point through an angle θ° and sketch θ°

 the new point on your graph. k°

4. The new point should have the same distance from

 the origin, but it will have a new angle. What is

 that new angle?

 (k + θ)°

5. Write the rotated point in terms of r and this

 new angle.

 (r∙cos(k+θ)°, r∙sin(k+θ)°)

6. You know formulae for the trig functions in the new representation of this point.

 Substitute these formulae and distribute to rewrite this rotated point another way.

 (r∙(cos(k°)∙cos(θ°) - sin(k°)∙sin(θ°), r(sin(k°)∙cos(θ°) + cos(k°)∙sin(θ°))

 (r∙cos(k°)∙cos(θ°) – r∙sin(k°)∙sin(θ°), r∙sin(k°)∙cos(θ°) + r∙cos(k°)∙sin(θ°))

7. Find expressions for the original x and y values that you used in problem #2 and

 Substitute those expressions in your answer to problem #6. You should have an

 expression for a rotated point in terms of x, y and trig functions of θ.

 (x∙cos(θ°) - y∙sin(θ°), y∙cos(θ°) + x∙sin(θ°))

8. Check your result by rotating the point (3, 4) through an angle of 90°. You should get

 (-4, 3).

 (3∙cos(90°) - 4∙sin(90°), 4∙cos(90°) + 3∙sin(90°))

 (3∙0 - 4∙1, 4∙0) + 3∙1) = (-4, 3) :-)

\*9. Write a transformation matrix that will rotate any point (x, y) through an angle θ.

 , since 