# Transcomputation - Exercise 5

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## Note

Polar-transcomplex multiplication and division are lexically identical to their polar-complex counterparts:

$$\begin{aligned}(r_1,\ \theta_1) \times (r_2,\ \theta_2) &= (r_1 r_2,\ \theta_1 + \theta_2) \\ (r_1,\ \theta_1) \div (r_2,\ \theta_2) &= (r_1/r_2,\ \theta_1 - theta_2)\end{aligned}$$

Rotation of a polar point $(r, \phi)$ by $\theta$ radians is identical to multiplication of the polar point by $(1, \theta)$.

## 1 Calculate Rotations

1.1 Rotate the polar point $(1, 0)$ by 0 radians.

1.2 Rotate the polar point $(1, 0)$ by $\pi/2$ radians.

1.3 Rotate the polar point $(1, \pi/2)$ by $-\pi/2$ radians.

1.4 Rotate the polar point $(1, 2)$ by $\infty$ radians.

1.5 Calculate the polar points corresponding to a square with Cartesian co-ordinates $(0, 0)$, $(1, 0)$, $(1, 1)$, $(0, 1)$.

1.6 Rotate the square in part (1.5) immediately above by $\pi/4$ radians.

## 2 Sketching

Sketch points and figures on a Cartesian plane of $(x, y)$ co-ordinates.

2.1 Sketch the rotation of the point in part (1.1) above.

2.2 Sketch the rotation of the point in part (1.2) above.

2.3 Sketch the rotation of the point in part (1.3) above.

2.4 Sketch the rotation of the point in part (1.4) above.

2.5 Sketch the rotation of the square in part (1.6) above.