

Problem 1 (4 points). We are given an angle $\theta = 15^\circ$ in standard position.

(i) (2 points) Find an angle coterminal with θ between 720° and 1080° .

Answer, in degrees: $15 + 360 * 2 = 735^\circ$ Answer, in radians: $735 \times \frac{2\pi}{360^\circ} = \frac{49}{12}\pi$

(ii) (2 points) Find *all* angles coterminal with θ .

Answer, in degrees: $15^\circ + n \cdot 360^\circ$ Answer, in radians: $15 \times \frac{2\pi}{360^\circ} + n \cdot 2\pi = \frac{1}{12}\pi + n \cdot 2\pi$.

Problem 2 (4 points). We are given an angle $\phi = \frac{5\pi}{4}$ in standard position.

(i) (2 points) Find an angle coterminal with ϕ between -4π and -2π .

Answer, in degrees: $-\frac{11}{4}\pi \times \frac{360^\circ}{2\pi} = -495^\circ$ Answer, in radians: $\frac{5}{4}\pi - 2 \times 2\pi = -\frac{11}{4}\pi$.

(ii) (2 points) Find *all* angles coterminal with ϕ .

Answer, in degrees: $\frac{5}{4}\pi \times \frac{360^\circ}{2\pi} + n \cdot 360^\circ = 225^\circ + n \cdot 360^\circ$ Answer, in radians: $\frac{5}{4}\pi + n \cdot 2\pi$.

Problem 3 (1 point). If the actual angle of an angle is 198° , then what is its reference angle?

Answer, in radians: The closest “ x -axis” from 198° is 180° , so the reference angle is $198^\circ - 180^\circ = 18^\circ$. In radians, this is $18^\circ \times \frac{2\pi}{360^\circ} = \frac{1}{10}\pi$. Note that the angle is in the third quadrant.

Problem 4 (1 point). If the reference angle of an angle in the fourth quadrant is $\frac{\pi}{18}$, then what is its actual angle?

Answer, in degrees: The closest “ x -axis” from the fourth quadrant is 2π , and so the acute angle is $2\pi - \frac{\pi}{18} = \frac{35}{18}\pi$. In degrees, this is $\frac{35}{18}\pi \times \frac{360^\circ}{2\pi} = 350^\circ$.