3.3B Sine and Cosine Function Values

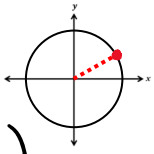
AP Precalculus

Solutions

3.3B Practice

For each problem, an angle in standard position in the xy-plane is given in radians. A circle is centered at the origin with the given radius. What are the coordinates of the point of intersection of the terminal ray of the angle and the circle?

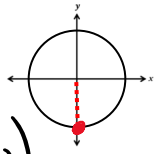
1. $\theta = \frac{\pi}{6}, r = 4$



$\left(4\cdot\frac{\sqrt{3}}{2}, 4\cdot\frac{1}{2}\right)$

$(2\sqrt{3}, 2)$

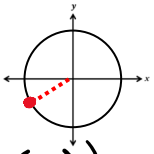
2. $\theta = \frac{3\pi}{2}, r = 7$



$(7\cdot 0, 7\cdot(-1))$

$(0, -7)$

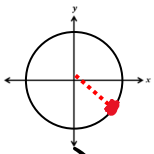
3. $\theta = \frac{7\pi}{6}, r = 6$



$\left(6\cdot\left(-\frac{\sqrt{3}}{2}\right), 6\cdot\left(-\frac{1}{2}\right)\right)$

$(-3\sqrt{3}, -3)$

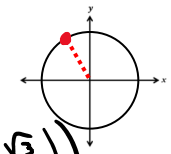
4. $\theta = \frac{7\pi}{4}, r = 5$



$\left(5\cdot\frac{\sqrt{2}}{2}, 5\cdot\left(-\frac{\sqrt{2}}{2}\right)\right)$

$\left(\frac{5\sqrt{2}}{2}, -\frac{5\sqrt{2}}{2}\right)$

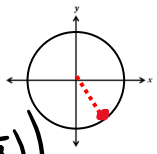
5. $\theta = \frac{2\pi}{3}, r = 12$



$\left(12\cdot\left(-\frac{1}{2}\right), 12\left(\frac{\sqrt{3}}{2}\right)\right)$

$(-6, 6\sqrt{3})$

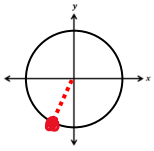
6. $\theta = \frac{5\pi}{3}, r = 3$



$\left(3\cdot\frac{1}{2}, 3\cdot\left(-\frac{\sqrt{3}}{2}\right)\right)$

$\left(\frac{3}{2}, -\frac{3\sqrt{3}}{2}\right)$

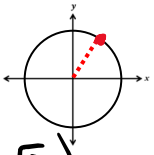
7. $\theta = \frac{4\pi}{3}, r = 8$



$\left(8\cdot\left(-\frac{1}{2}\right), 8\cdot\left(-\frac{\sqrt{3}}{2}\right)\right)$

$(-4, -4\sqrt{3})$

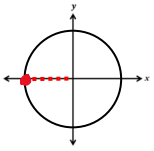
8. $\theta = \frac{\pi}{3}, r = 16$



$\left(16\cdot\frac{1}{2}, 16\cdot\frac{\sqrt{3}}{2}\right)$

$(8, 8\sqrt{3})$

9. $\theta = \pi, r = 9$

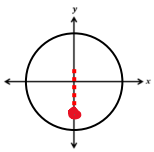


$(9\cdot(-1), 9\cdot 0)$

$(-9, 0)$

In the xy-plane, the terminal ray of angle θ in standard position intersects a circle of radius r at the given point. What are the values of θ and r?

10. $(\underset{10}{0}, \underset{10}{-10})$

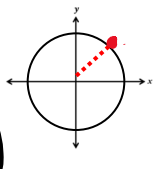


$(10\cdot 0, 10(-1))$

$\theta = 3\pi/2$

$r = 10$

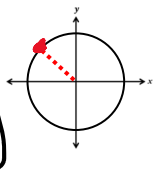
11. $(\underset{6}{3\sqrt{2}}, \underset{6}{3\sqrt{2}})$



$\left(6\cdot\frac{\sqrt{2}}{2}, 6\cdot\frac{\sqrt{2}}{2}\right)$

$\theta = \pi/4 \quad r = 6$

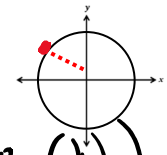
12. $\left(-\frac{3\sqrt{2}}{2}, \frac{3\sqrt{2}}{2}\right)$



$\left(3\cdot\left(-\frac{\sqrt{2}}{2}\right), 3\cdot\frac{\sqrt{2}}{2}\right)$

$\theta = \frac{3\pi}{4} \quad r = 3$

13. $(-9\sqrt{3}, 9)$

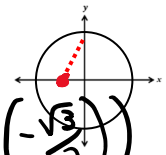


$(18 \cdot (-\frac{\sqrt{3}}{2}), 18 \cdot (\frac{1}{2}))$

$\theta = \frac{5\pi}{6}$

$r = 18$

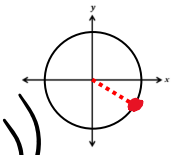
14. $(-15, -15\sqrt{3})$



$(30 \cdot (-\frac{1}{2}), 30 \cdot (-\frac{\sqrt{3}}{2}))$

$\theta = \frac{4\pi}{3}$ $r = 30$

15. $(\frac{7\sqrt{3}}{2}, -\frac{7}{2})$



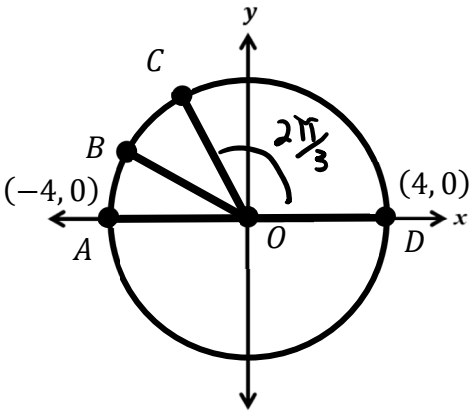
$(7 \cdot \frac{\sqrt{3}}{2}, 7 \cdot (-\frac{1}{2}))$

$\theta = \frac{11\pi}{6}$ $r = 7$

3.3B Sine and Cosine Function Values

3.3B Test Prep

16. The figure shows a circle of radius 4 along with five labeled points in the xy-plane.



B

$\angle AOC = \pi - \frac{2\pi}{3}$

$\angle AOC = \frac{\pi}{3}$

$\frac{1}{2}\angle AOC = \angle AOB$

$\frac{\pi}{6} = \angle AOB$

The measure of angle DOC is $\frac{2\pi}{3}$. The measure of angle AOB is half of angle AOC. What are the coordinate points of point B?

$\frac{\pi}{6} = \angle COB$

(A) $\left(-4\cos\left(\frac{5\pi}{6}\right), 4\sin\left(\frac{5\pi}{6}\right)\right)$

(B) $\left(4\cos\left(\frac{5\pi}{6}\right), 4\sin\left(\frac{5\pi}{6}\right)\right)$

(C) $\left(-2\cos\left(\frac{5\pi}{6}\right), 2\sin\left(\frac{5\pi}{6}\right)\right)$

(D) $\left(2\cos\left(\frac{5\pi}{6}\right), 2\sin\left(\frac{5\pi}{6}\right)\right)$

$\therefore \angle DOB = \frac{2\pi}{3} + \frac{\pi}{6}$

$\angle DOB = \frac{4\pi}{6} + \frac{\pi}{6}$

$\angle DOB = \frac{5\pi}{6}$

17. Angles A and B are in standard position in the xy-plane. The measure of angle A is $\frac{\pi}{6}$ radians, and the measure of angle B is $\frac{11\pi}{6}$ radians. The terminal rays of both angles intersect a circle centered at the origin with radius 16. What is the distance between these two points of intersection: the circle and terminal ray of angle A, and the circle and terminal ray of angle B?

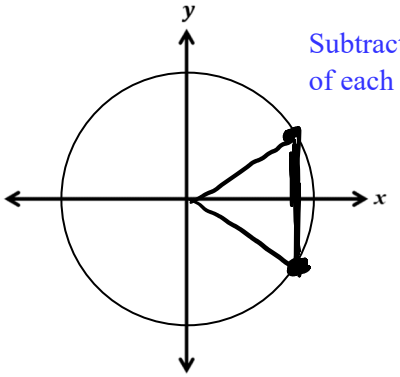
A

(A) $16\sin\frac{\pi}{6} - 16\sin\frac{11\pi}{6}$

(B) $8\sin\frac{\pi}{6} - 8\sin\frac{11\pi}{6}$

(C) $16\cos\frac{\pi}{6} - 16\cos\frac{11\pi}{6}$

(D) $8\cos\frac{\pi}{6} - 8\cos\frac{11\pi}{6}$



Subtract the y-values of each coordinate.

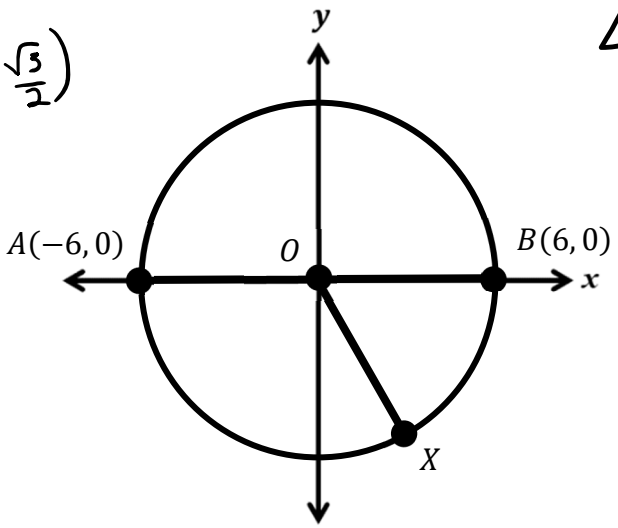
---

18. The figure shows a circle of radius 6 along with the origin and three labeled points in the xy-plane. If the coordinates of X are $\left(\frac{3}{6}, \frac{-3\sqrt{3}}{6}\right)$, what is the measurement of angle AOX?

$\left(6\cdot\frac{1}{2}, 6\cdot\left(-\frac{\sqrt{3}}{2}\right)\right)$

$\theta = \frac{5\pi}{3}$

$r = 6$



$\angle AOX = \frac{5\pi}{3} - \pi$

$\frac{5\pi}{3} - \frac{3\pi}{3}$

$\frac{2\pi}{3}$

B

(A) $\frac{\pi}{3}$

(B) $\frac{2\pi}{3}$

(C) $\frac{4\pi}{3}$

(D) $\frac{5\pi}{3}$