Algebra and Trigonometry — Joysheet 11
MAT 150, Fall 2017 — D. Ivanšić

Name: Saul Ocean

Covers: 6.3, 6.4 *Show all your work!*

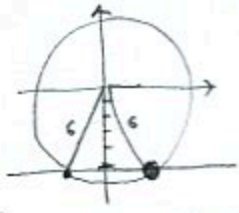
1. (9pts) If $\csc\theta = -\frac{6}{5}$ and θ is in the fourth quadrant, find the exact values of all the trigonometric functions of θ. Draw a picture.

$\csc\theta = -\frac{6}{5}$

$\sin\theta = -\frac{5}{6} = \frac{-5}{6} = \frac{y}{r}$

$x^2 + (-5)^2 = 6^2$

$x^2 = 11 \quad x = \pm\sqrt{11}$, $x = \sqrt{11}$ due to 4th Quad.

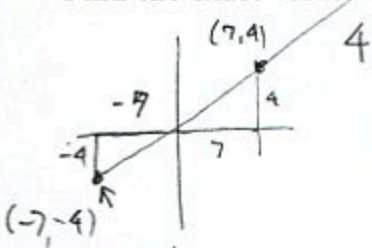


$\cos\theta = \frac{\sqrt{11}}{6}$ $\quad \sec\theta = \frac{6}{\sqrt{11}}$

$\sin\theta = -\frac{5}{6}$ $\quad \csc\theta = -\frac{6}{5}$

$\tan\theta = \frac{-5}{\sqrt{11}} = -\frac{5}{\sqrt{11}}$ $\quad \cot\theta = -\frac{\sqrt{11}}{5}$

2. (7pts) The terminal side of angle θ is in the third quadrant and lies on the line $4x - 7y = 0$. Find the exact values of $\cos\theta$ and $\tan\theta$. Draw a picture.



$4x - 7y = 0$

$y = -\frac{4x}{-7}$

$y = \frac{4}{7}x$

$r^2 = 7^2 + 4^2$

$r^2 = 65$

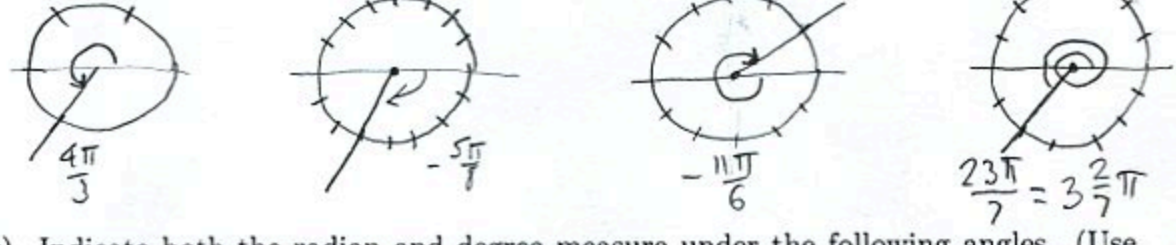
$r = \sqrt{65}$

$\cos\theta = \frac{-7}{\sqrt{65}} = -\frac{7}{\sqrt{65}}$

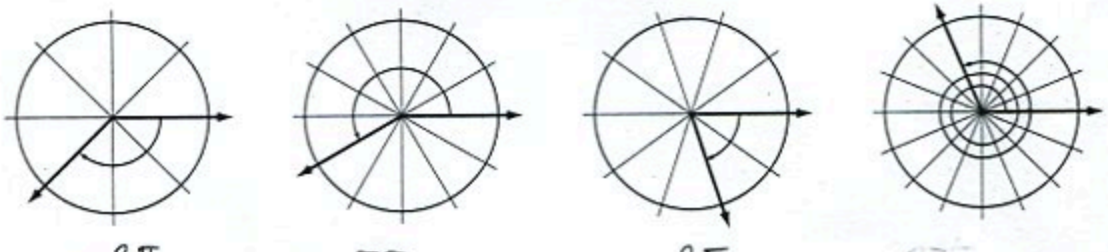
$\tan\theta = \frac{-4}{-7} = \frac{4}{7}$

3. (8pts) Sketch angles in standard position with indicated radian measure.

$\frac{4\pi}{3}$ $\quad -\frac{5\pi}{8}$ $\quad -\frac{11\pi}{6}$ $\quad \frac{23\pi}{7}$



4. (8pts) Indicate both the radian and degree measure under the following angles. (Use equally-spaced lines to help you determine what the angles are.)



$-\frac{3\pi}{4}$ $\quad -135°$

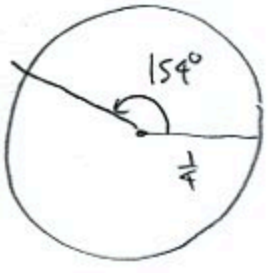
$\frac{7\pi}{6}$ $\quad 210°$

$-\frac{2\pi}{5}$ $\quad -72°$

$2 \cdot 2\pi + \frac{5\pi}{8} = \frac{37\pi}{8}$

$720° + 112.5° = 832.5°$

5. (8pts) A circular irrigation system with radius 1/4 mile rotates 11° in an hour. How far in miles has the part on the rim traveled, if the system has worked 14 hours?

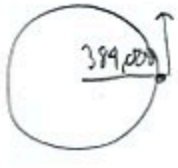


In 14 hours it rotates $14 \cdot 11^\circ = 154^\circ$

$154^\circ = \frac{\pi}{180^\circ} \cdot 154 = \frac{77\pi}{90}$ radians

$s = r\theta = \frac{1}{4} \cdot \frac{77\pi}{90}$ radians $= \frac{77\pi}{360}$ mi $= 0.671952$ miles

6. (8pts) If we approximate Moon's path by a circle (it is really an ellipse), it rotates around earth along a circle of radius 384,000 kilometers once every 27.321661 days. What is its linear speed in kilometers per second?



$v = r\omega = 384{,}000 \cdot \frac{2\pi}{27.321661} = 88{,}308.80223$ km/day

$= \frac{88{,}308.80223}{24 \cdot 3600} \frac{\text{km}}{\text{s}} = 1.0220923$ km/s

(24 · 3600: seconds in a day)

7. (12pts) A wheel of radius 4in sits on a conveyor belt, which makes it rotate. The conveyor belt moves at 1/3 mile per hour.
a) What is the angular speed of the wheel, in radians per second?
b) How many revolutions per hour does the wheel make?

a) $v = r\omega$ so $\omega = \frac{v}{r} = \frac{\frac{1}{3} \text{ mi/hr}}{4 \text{ in}} = \frac{\frac{1}{3} \cdot 5280 \cdot 12 \text{ in}}{4 \cdot 3600 \text{ sec.}} =$

$= \frac{5280 \cdot 12}{12 \cdot 3600} = \frac{528}{360} = 1.466667$ rad/s

b) $\frac{528}{360}$ rad/s $= \frac{528}{360} \cdot 3600$ rad/hr $= \frac{5280}{2\pi}$ rev/hr

$= 840.3381$ rev/hr