Quiz #1 Solutions   <u>17 total possible points; grades out of 15 points</u>
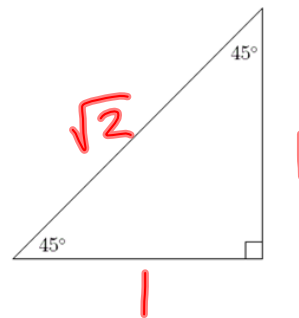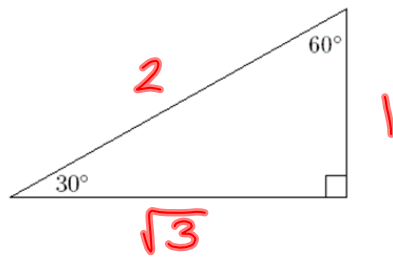
$$\frac{1}{\csc x} = \sin x$$

$$\frac{\cos x}{\sin x} = \cot x$$

$$\frac{1}{\cos x} = \sec x$$

$$\sec(90° - x) = \csc x$$
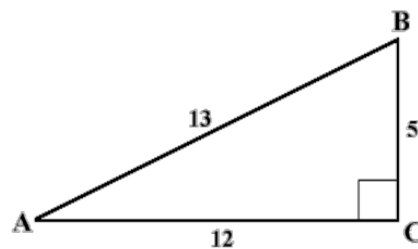
$$\cot(90° - x) = \tan x$$

[triangle: 60° at top, 30° at bottom left, hypotenuse 2, vertical side 1, base $\sqrt{3}$]

[triangle: 45° top, 45° bottom, hypotenuse $\sqrt{2}$, vertical side 1, base 1]

$$\cos B = \frac{5}{13}$$

$$\cot A = \frac{12}{5}$$

$$\sec A = \frac{13}{12}$$

[right triangle A, B, C with AB = 13, BC = 5, AC = 12, right angle at C]

<u>Homework questions?</u>

<u>5.3</u>

27.

[diagram of angle with point $(-2\sqrt{3}, -4)$, sides labeled $-2\sqrt{3}$, -4, hypotenuse $2\sqrt{7}$, angle ϕ]

$$(-2\sqrt{3}, -4)$$
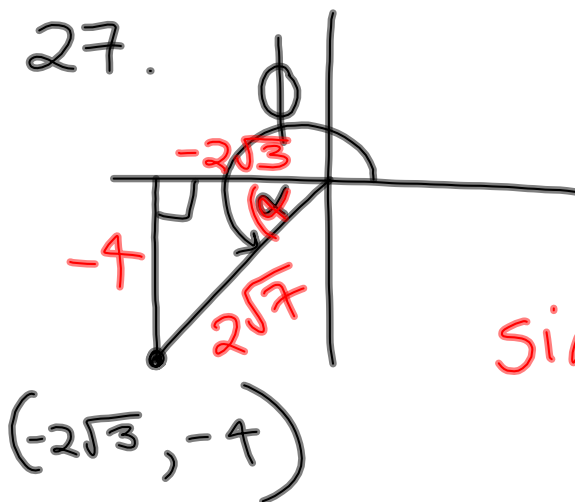
$$h^2 = (-2\sqrt{3})^2 + (-4)^2$$

$$= 12 + 16 = 28$$

$$h = \sqrt{28} = 2\sqrt{7}$$

$$\sin\phi = \frac{-4}{2\sqrt{7}} = \frac{-2}{\sqrt{7}}$$

$$\sec\phi = \frac{2\sqrt{7}}{-2\sqrt{3}} = -\frac{\sqrt{7}}{\sqrt{3}}$$

. . .

1

$$\frac{5.2}{}$$

31.

boat ✗

12 km

63°20'

base

63.3°

$$\cos 63.3° = \frac{12}{x}$$

$$x = \frac{12}{\cos 63.3°} \approx \boxed{24 \text{ km}}$$ ✗

$$\tan 63° = \frac{x}{12}$$

$$x = \boxed{12 \tan 63°} \text{ km}$$

$$\approx 24 \text{ km}$$

5.3 Trigonometric Functions of Any Angle

30. The terminal side of angle θ lies along the line $4x + y = 0$ in ~~QII~~ QIV.
Find $\sin \theta$, $\cos \theta$, and $\tan \theta$.
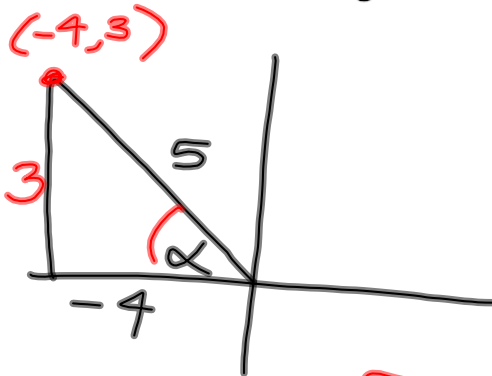
$$y = -4x$$

$$h^2 = 1^2 + (-4)^2$$
$$= 1 + 16$$
$$h = \sqrt{17}$$

$h = \sqrt{17}$

θ α -4
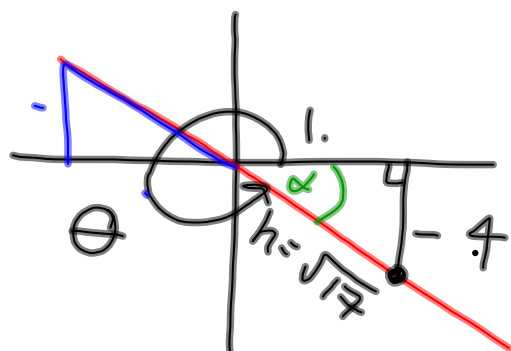
$$\sin \theta = -\frac{4}{\sqrt{17}}$$
$$\cos \theta = \frac{1}{\sqrt{17}}$$
$$\tan \theta = -4$$

36. Given that $\cos \alpha = -\frac{4}{5}$ and $\alpha \in QII$,

find the other 5 trigonometric function values of α.

$(-4,3)$

$\sec \alpha = -\frac{5}{4}$

$\cot \alpha = -\frac{4}{3}$

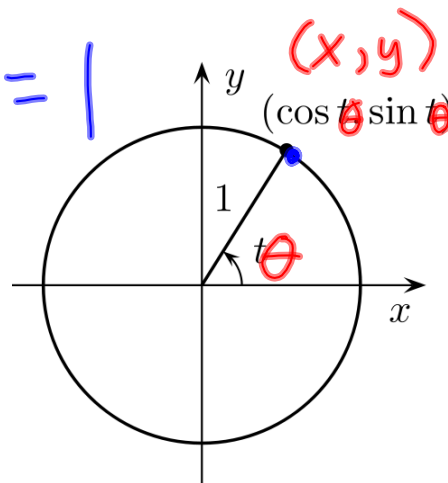$\sin \alpha = \frac{3}{5}$

✱ hypotenuse is always positive!

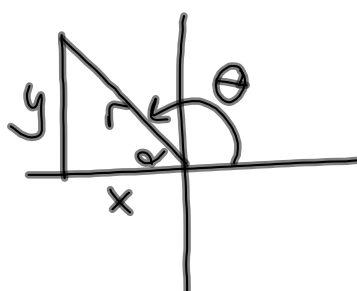$a^2 + (-4)^2 = 5^2$

$a^2 = 25 - 16$

$a^2 = 9$

$a = 3$

The unit circle and function values of 30°, 45°, and 60° reference angles

unit circle:
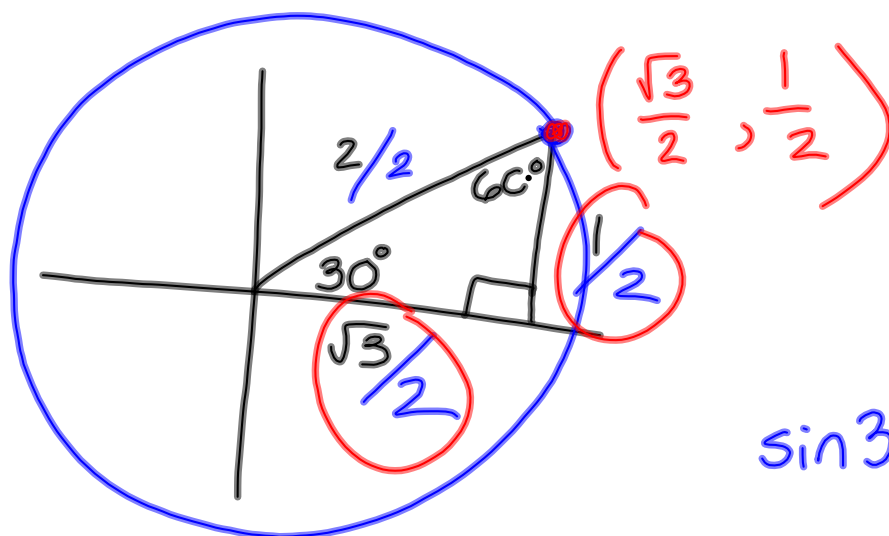
radius $r = 1$

center $(0,0)$

$$X^2 + y^2 = 1$$

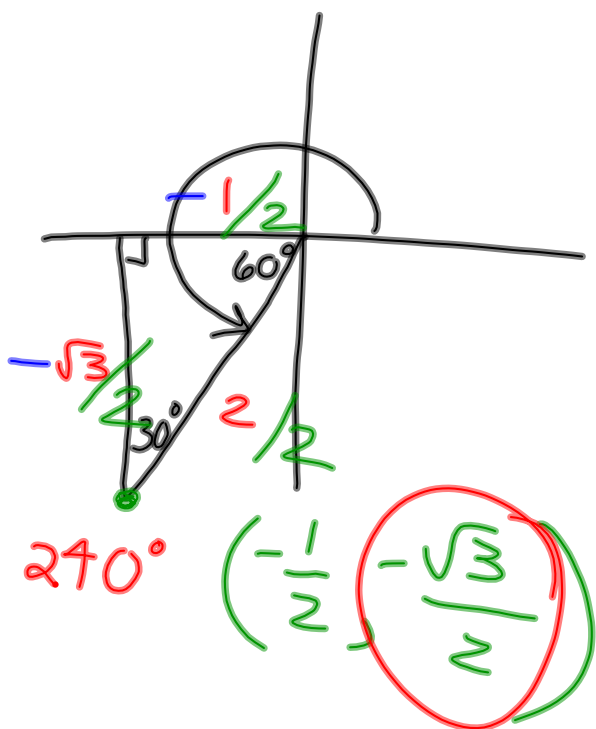$(x-h)^2 + (y-k)^2 = r^2$

center: (h,k) ; radius : r

(x,y)

$(\cos t, \sin t)$

$\sin \theta = \frac{y}{r}$ $y = r \sin \theta$

$\cos \theta = \frac{x}{r}$ $x = r \cos \theta$

$2/2$ $60°$ $\left(\dfrac{\sqrt{3}}{2}, \dfrac{1}{2}\right)$

$30°$

$\dfrac{1}{2}$

$\dfrac{\sqrt{3}}{2}$

$\sin 30° = \dfrac{1}{2}$

$\cos 30° = \dfrac{\sqrt{3}}{2}$

$\sin 240° = ?$

$\dfrac{-\sqrt{3}}{2}$

$-1/2$

$60°$

$-\sqrt{3}/2$ $30°$ $2/2$

$240°$ $\left(-\dfrac{1}{2}, -\dfrac{\sqrt{3}}{2}\right)$

<u>What about quadrantal angles?</u>

$(\cos\theta, \sin\theta)$

$\sec\theta = \dfrac{1}{\cos\theta}$

$\csc\theta = \dfrac{1}{\sin\theta}$

$\tan\theta = \dfrac{\sin\theta}{\cos\theta}$

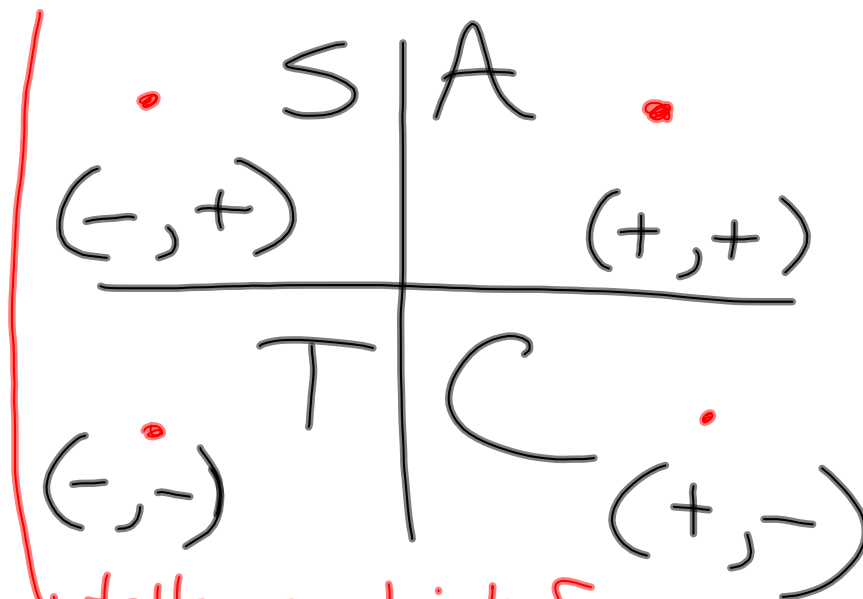$\cot\theta = \dfrac{\cos\theta}{\sin\theta}$

$(0,1)$

$(-1,0)$

$(1,0)$
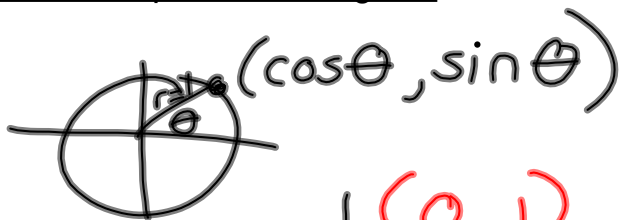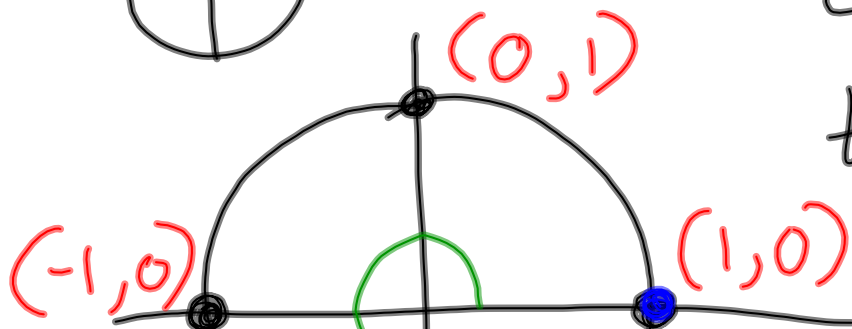
$\tan 0° = \dfrac{0}{1} = 0$

$\sec 270° = \dfrac{1}{0} = \text{undefined}$

$(0,-1)$

$\dfrac{\sqrt{2}}{2} = \dfrac{1}{\sqrt{2}}$
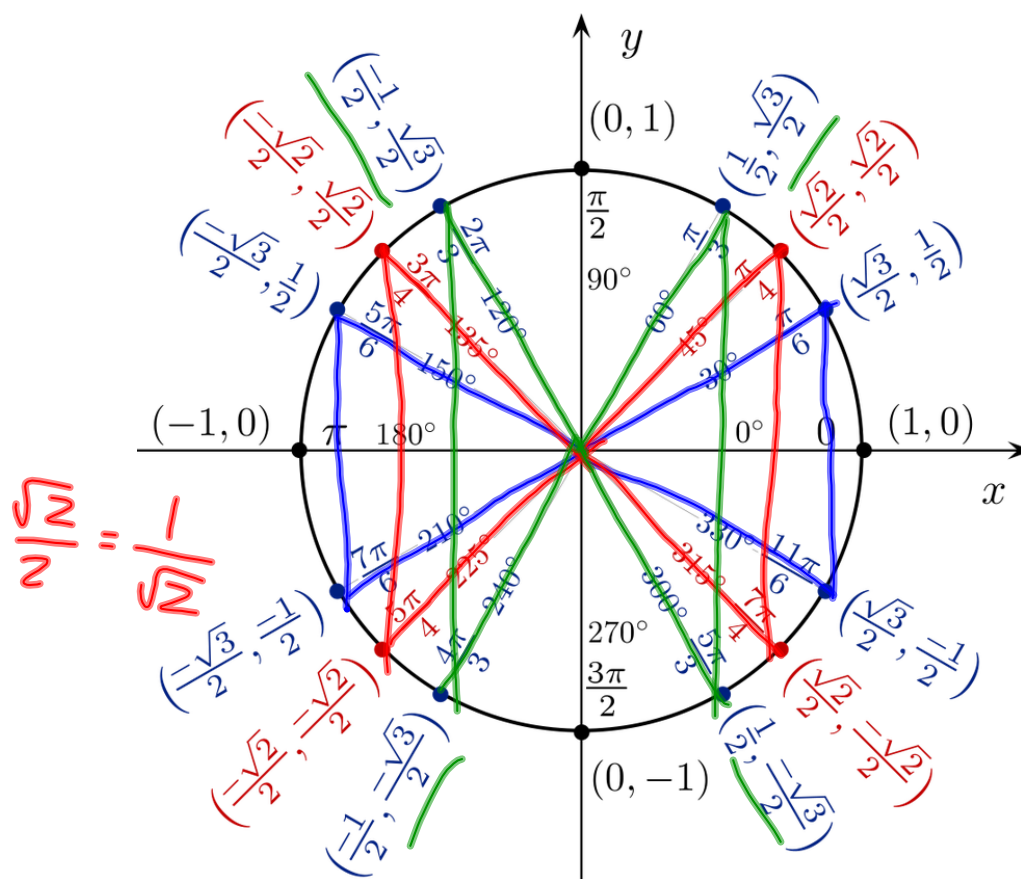
All Students Take Calculus

$$x = \cos\theta$$

$$\sec\theta = \frac{1}{x}$$

$$y = \sin\theta$$

$$\frac{1}{y} = \csc\theta$$

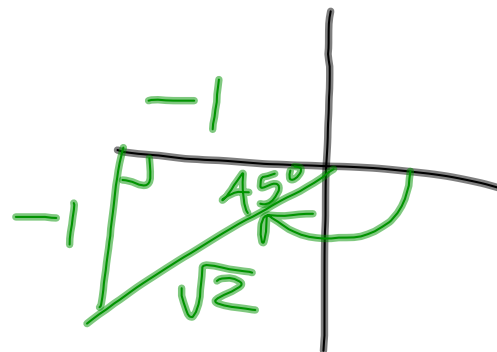| S	A
$(-,+)$	$(+,+)$
T	C
$(-,-)$	$(+,-)$

→ tells us which functions (& reciprocals) are positive

Find the trig function value of the given angle (note that they all have either a 30°, 45°, or 60° reference angle OR are quadrantal angles).
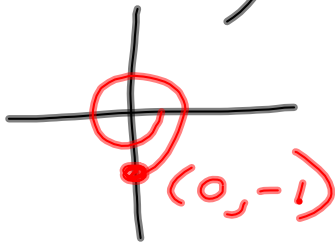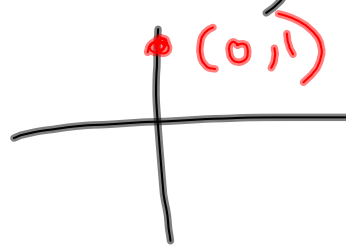
$$\tan 300° = -\sqrt{3}$$

$$\sec(-135°) = -\sqrt{2}$$

$$\sin(-450°) = -1$$

$$\csc(90°) = \frac{1}{1} = 1$$

(0,1)

(0,-1)

$$\cot(-90°) = 0$$

(0,-1)

$$\cos(120°) = -\frac{1}{2}$$

$\sqrt{3}$ 2

$180°$ $60°$

-1
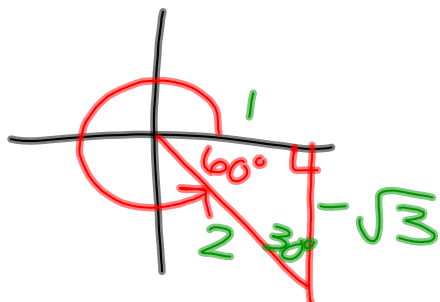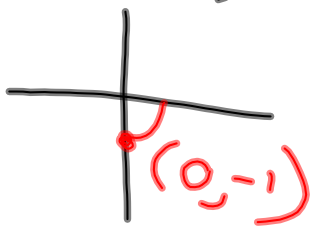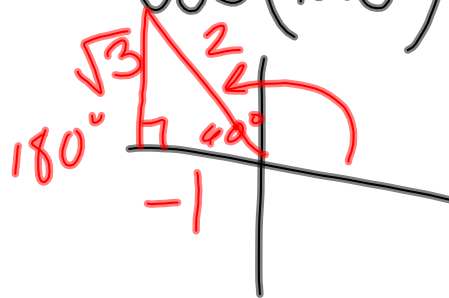
Angles with the same reference angles have the same trig function values.

$106°$

(x,y)

$r=1$

$74°$ $74°$

$74°$ $74°$

$254°$

$286°$
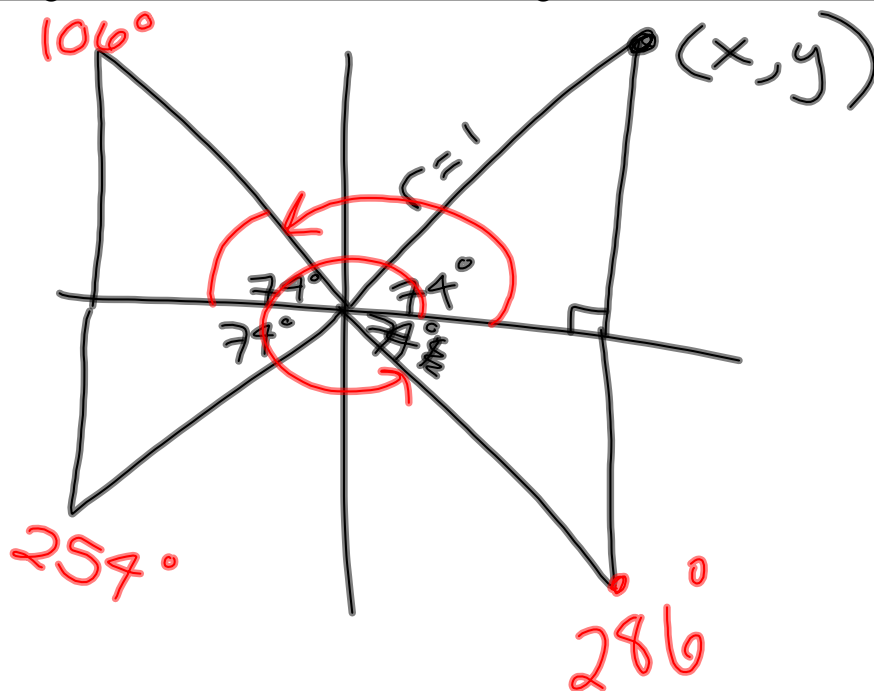
80. Given that $\sin 27° \approx 0.4540$, $\cos 27° \approx 0.8910$, and $\tan 27° \approx 0.5095$, find the trigonometric function values for 333°.

$\sin 333° =$
$-\sin 27°$
$= -0.4540$

$\cos 333° =$
$\cos 27°$
$= 0.8910$

$\tan 333° = -0.5095$

(x,y)
(+,+)
(+,-)
27°
333°
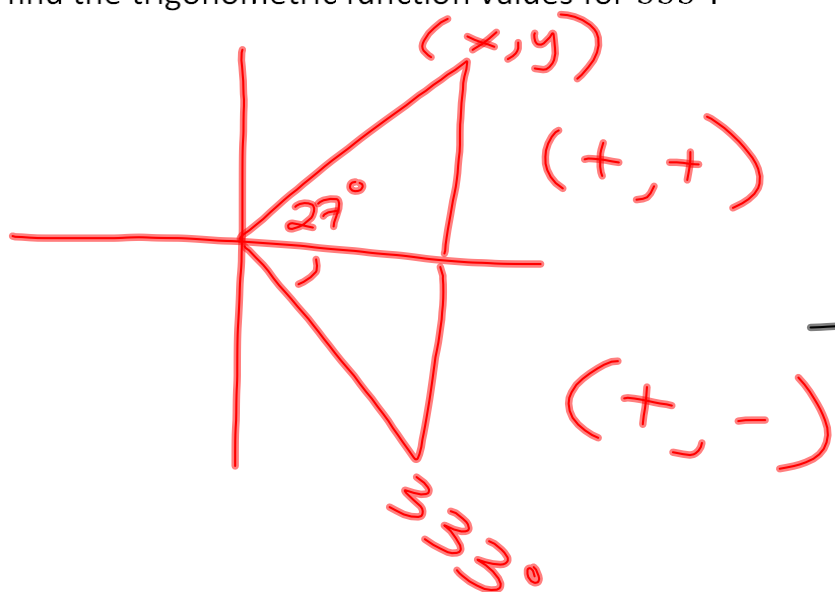
Homework: 5.3 #29-37 odd, 39-70 all; 71-81 odd