ID:_____   Name:_____

1. Convert from degree to radian.

a) 180°   b) 90°   c) 360°   d) 240°   e) −135°   f) −120°

$$240° \cdot \frac{\pi}{180°} = \frac{4\pi}{3}$$

$$-120° \cdot \frac{\pi}{180°} = -\frac{2\pi}{3}$$

$$180° \cdot \frac{\pi}{180°} = \pi \qquad 90° \cdot \frac{\pi}{180°} = \frac{\pi}{2}$$

$$360° \cdot \frac{\pi}{180°} = 2\pi$$

$$-135° \cdot \frac{\pi}{180°} = -\frac{3\pi}{4}$$

2. Convert from radian to degree.

$$\frac{\pi}{4} \cdot \frac{180°}{\pi} = 45°$$

a) $\frac{\pi}{3}$ b) $\frac{3\pi}{2}$ c) $\frac{\pi}{4}$ d) $\frac{\pi}{6}$ e) $-\frac{4\pi}{3}$ f) $-\frac{5\pi}{4}$
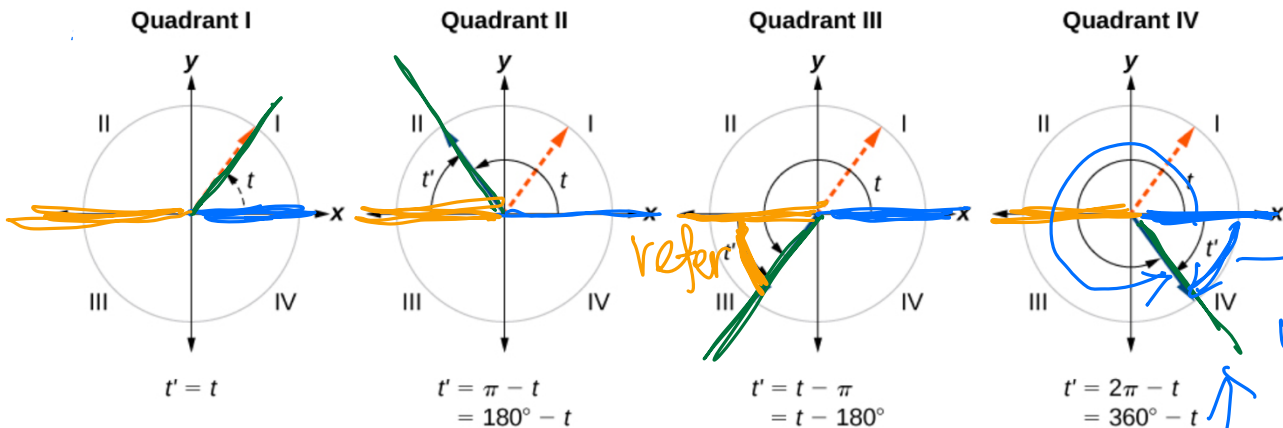
$$-\frac{4\pi}{3} \cdot \frac{180°}{\pi} = -260°$$

$$\frac{\pi}{3} \cdot \frac{180°}{\pi} = 60° \qquad \frac{3\pi}{2} \cdot \frac{180°}{\pi} = \frac{3}{2} \cdot 180°$$

$$\frac{\pi}{6} \cdot \frac{180°}{\pi} = 30°$$

$$-\frac{5\pi}{4} \cdot \frac{180°}{\pi} = -5 \cdot 45°$$

$$= 270° \qquad\qquad = -225°$$

3. Reference Angle:

Quadrant I	Quadrant II	Quadrant III	Quadrant IV
$t' = t$	$t' = \pi - t$ $= 180° - t$	$t' = t - \pi$ $= t - 180°$	$t' = 2\pi - t$ $= 360° - t$

How to find the reference angle of the given angle ?

refer

$II(-,+)$ $I(+,+)$

$III(-,-)$ $IV(+,-)$
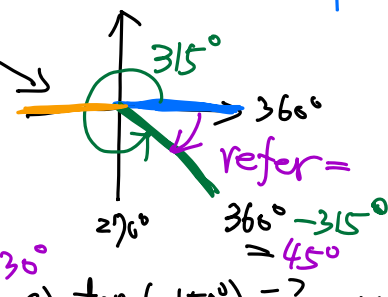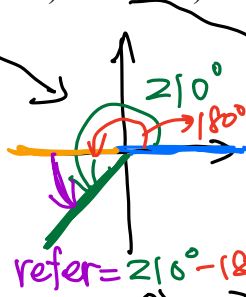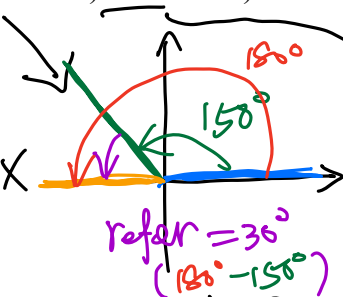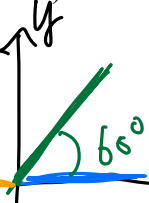
4. Find the reference angle of the given angle.

a) 60°   b) 150°   c) 210°   d) −150°   e) 315°   f) −135°

refer = 60°

refer = 30° (180° − 150°)

refer = 210° − 180° = 30°

refer = 360° − 315° = 45°

extra question: a) $\sin(150°) = ?$ b) $\cos(210°) = ?$ c) $\tan(-150°) = ?$ ....

d)

$-180°$ $30°$ $\to X \ 0°$
$-150°$ $-90°$

$-150° - (-180°) = 30°$

f)

$-180°$ $45°$ $\to X \ 0°$
$-135°$ $-90°$

$-135° - (-180°) = 45°$

$\sin(150°) = ?$

$150°$ $30°$ 180 $\to X \ 0°$ $90°$

$O = \frac{1}{2}$ $60°$ $1 = H$
$30°$ $150°$
$-\frac{\sqrt{3}}{2} = A$
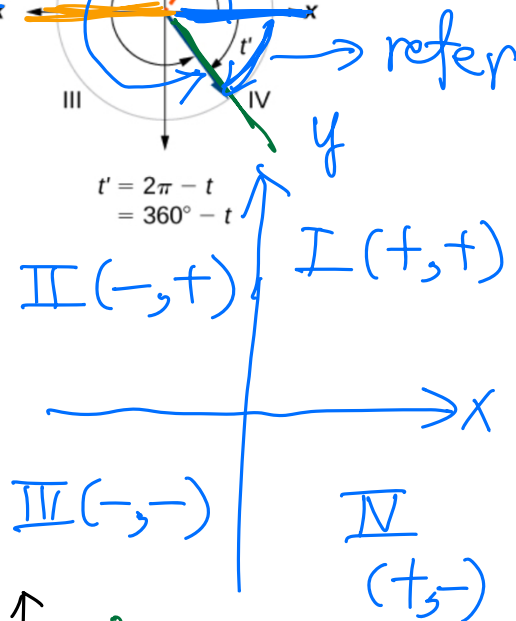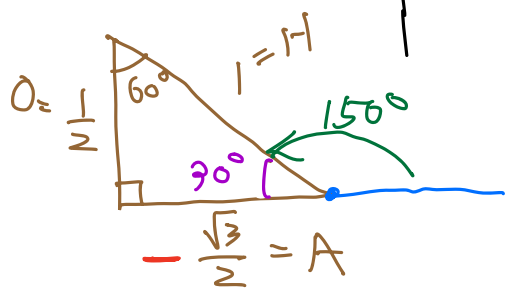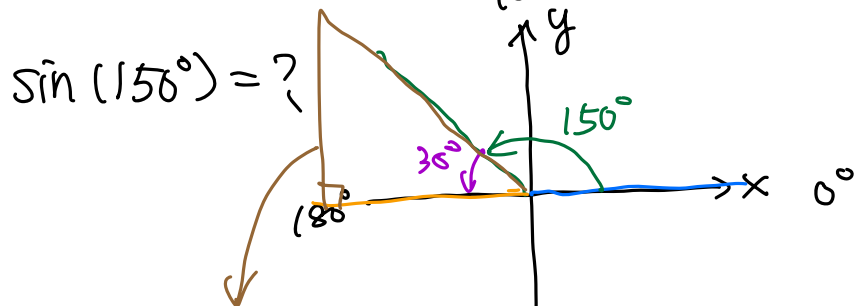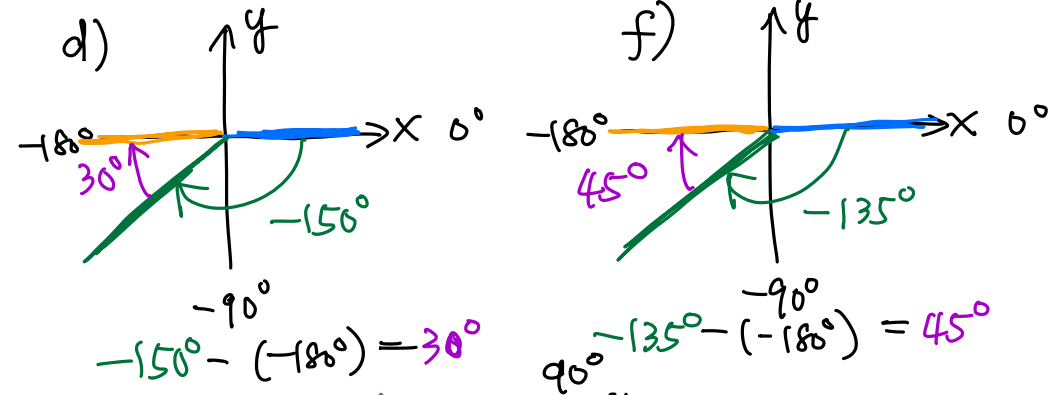
$\sin(150°) = \frac{O}{H} = \frac{\frac{1}{2}}{1} = \frac{1}{2}$

$\cos(150°)$
$\qquad = \frac{A}{H} = \frac{-\frac{\sqrt{3}}{2}}{1} = -\frac{\sqrt{3}}{2}$

$\tan(150°) = \frac{\sin(150°)}{\cos(150°)} = \frac{\frac{1}{2}}{-\frac{\sqrt{3}}{2}}$
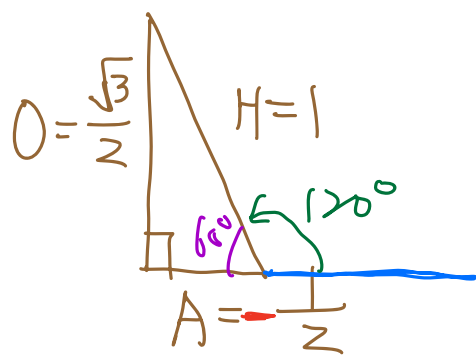
$\qquad = \frac{1}{2} \cdot \left(-\frac{2}{\sqrt{3}}\right) = -\frac{1}{\sqrt{3}}$

$\sin(210°) = ?$

$210°$ $90°$ $180°$ $\to X \ 0°$
$210° - 180° = 30°$ $290°$

$A = -\frac{\sqrt{3}}{2}$ $210°$
$30°$
$-\frac{1}{2} = O$ $H = 1$

$\sin(210°) = \frac{-\frac{1}{2}}{1} = -\frac{1}{2}$

$\cos(210°) = \frac{-\frac{\sqrt{3}}{2}}{1} = -\frac{\sqrt{3}}{2}$

$90°$ $120°$ $60°$ 180 $\to 0°$

$\sin(120°) = ?$

$O = \frac{\sqrt{3}}{2}$ $H = 1$
$60°$ $120°$
$A = -\frac{1}{2}$

$\sin(120°) = \frac{O}{H} = \frac{\frac{\sqrt{3}}{2}}{1} = \frac{\sqrt{3}}{2}$

$\cos(120°) = \frac{A}{H} = \frac{-\frac{1}{2}}{1} = -\frac{1}{2}$

$\tan(120°) = \frac{\frac{\sqrt{3}}{2}}{-\frac{1}{2}}$

$\qquad = \frac{\sqrt{3}}{2} \cdot (-2)$

$\qquad = -\sqrt{3}$

5. Unit Circle:

II (,)
Positive: sin, csc
Negative: cos, tan, sec, cot

(,)
90°

I (,)
Positive: sin, cos, tan, sec, csc, cot
Negative: none

(−, −)

(−, −)
120°

(−, −)
135°

150°

(−, −)
60°

(−, −)
45°

30°

(,) 180°

0°   0 (,)
360°   2π

210°
225°
240°

(−, −)

(−, −)

330°
315°
300°

(−, −)

(−, −)

(−, −)
270°

(,)

(−, −)

Positive: tan, cot
Negative: sin, cos, sec, csc
III (,)

Positive: cos, sec
Negative: sin, tan, csc, cot
IV (,)
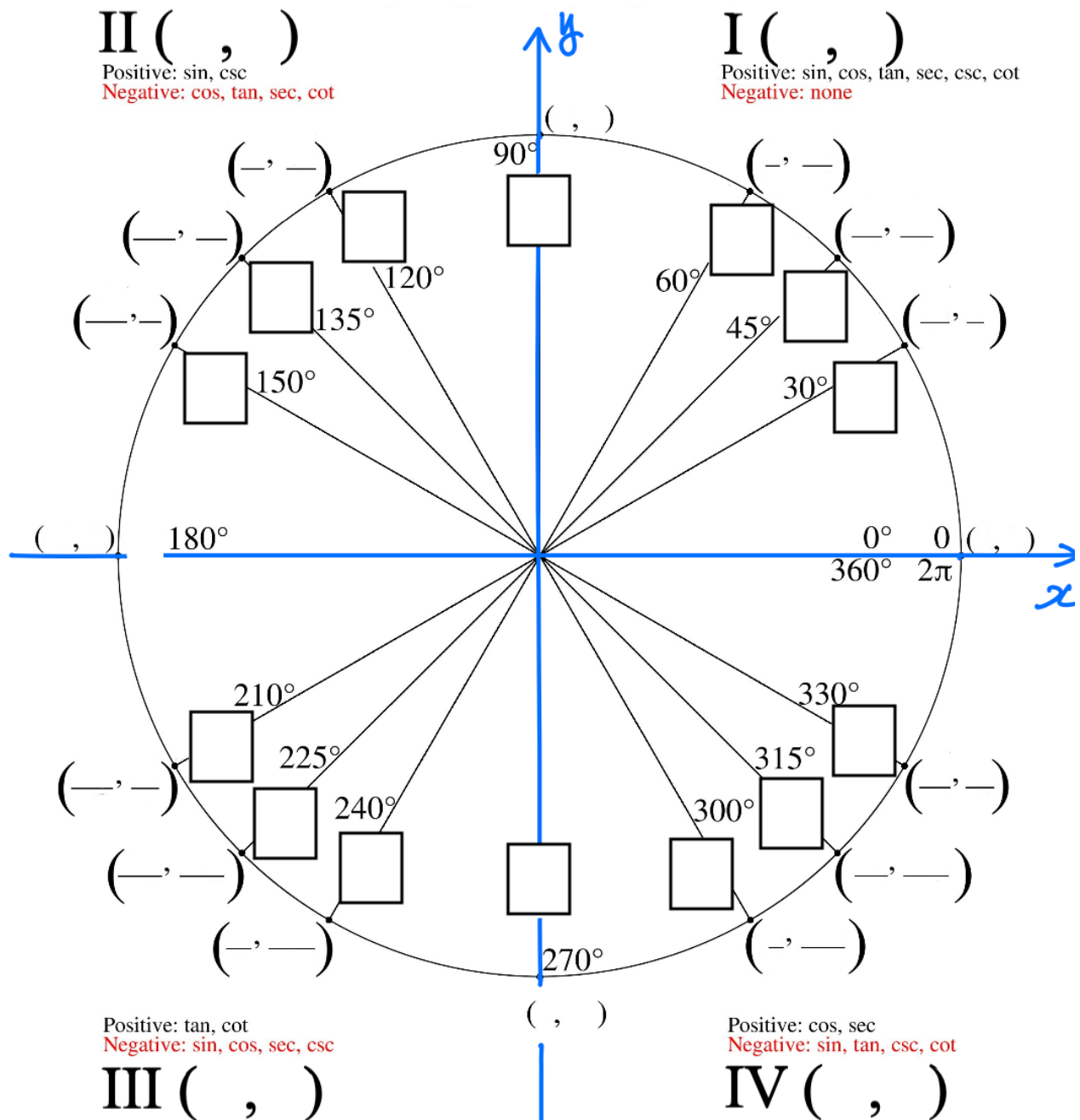
6. Find the exact solutions to the trigonometric equation for $0 \le x < 2\pi$. $(x \epsilon [0, 2\pi))$.

$$4\sin(x) + 2 = 0.$$