Math 150 Fall 07 Name:

QUIZ #1 @ 85 points

Solve the problems on separate paper. Clearly label the problems. Show all steps in order to get credit. No proof, no credit given

1. Solve the following equations:

a) $x^2 = 5x$

b) $(2t-1)^2 = 9$

c) $2p^2 - 3b = -1$

d) $x^3 + 4x^2 - 9x - 36 = 0$

e) $x^4 - 10x^2 + 9 = 0$

2. Find the remaining sides of a $30^\circ - 60^\circ - 90^\circ$ if the side opposite 60° is 8.

3. Draw an angle of 45° in standard position.

a) Find a point on the terminal side of the angle.
b) Find the distance from the origin to that point.
c) Find two other angles that are coterminal with the given angle, one positive and one negative. Mark them on the drawing.

4. Find the remaining functions of q if $\sin q = \frac{4}{7}$ and q terminates in quadrant II.

5. Make a drawing and indicate the quadrants in which the terminal side of q must lie in order that

a) $\cos q < 0$

b) $\sin q > 0$

c) $\tan q < 0$

Math 150 Quiz #1 - SOLUTIONS

(1)

(a) $x^2 = 5x$

$x^2 - 5x = 0$

$x(x-5) = 0$

$x = 0$ OR $x - 5 = 0$

$x = 5$

$x \in \{0, 5\}$

(b) $(2t-1)^2 = 9$

$\sqrt{(2t-1)^2} = \sqrt{9}$

$2t - 1 = \pm 3$

$2t = 1 \pm 3$

$2t = 4$ OR $2t = -2$

$t = 2$ $t = -1$

$t \in \{2, -1\}$

(c) $2p^2 - 3p = -1$

$2p^2 - 3p + 1 = 0$

$p = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $\begin{cases} a = 2 \\ b = -3 \\ c = 1 \end{cases}$

$p = \dfrac{3 \pm \sqrt{9 - 4(2)(1)}}{2(2)} = \dfrac{3 \pm 1}{4}$

$p = 1$ OR $p = \frac{1}{2}$

$p \in \{1, \frac{1}{2}\}$

(d) $x^3 + 4x^2 - 9x - 36 = 0$

$x^2(x+4) - 9(x+4) = 0$

$(x+4)(x^2 - 9) = 0$

$(x+4)(x-3)(x+3) = 0$

$x + 4 = 0$ OR $x - 3 = 0$ OR $x + 3 = 0$

$x = -4$ $x = 3$ $x = -3$

$x \in \{-4, -3, 3\}$

(e) $x^4 - 10x^2 + 9 = 0$

let $x^2 = t$

then $x^4 = t^2$

then the equation becomes

$t^2 - 10t + 9 = 0$

$(t-9)(t-1) = 0$

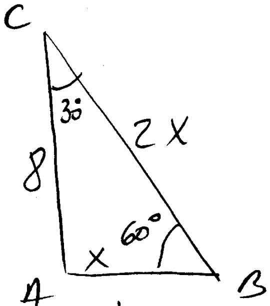
$t = 9$ OR $t = 1$

$x^2 = 9$ $x^2 = 1$

$x = \pm 3$ $x = \pm 1$

$x \in \{-1, 1, -3, 3\}$

(2)



$C = 30°$ (as it opposes the smaller leg)

$B = 60°$ (as it opposes the larger leg)

So, $AC = 8$ (given)

We know that in a right Δ, the side that opposes the $30°$ angle is half of the hypotenuse

$$AB = \frac{1}{2} BC$$

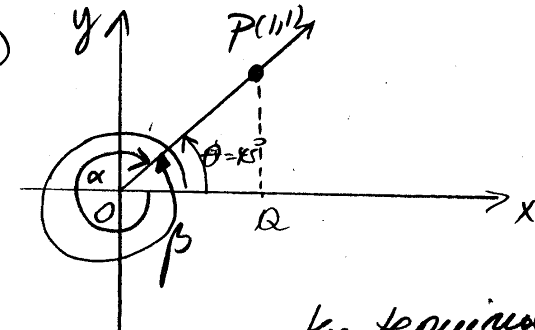
Let $AB = x$, then $BC = 2x$

ΔABC: Pythagorean theorem

$$AB^2 + AC^2 = BC^2$$
$$x^2 + 8^2 = (2x)^2$$
$$x^2 + 64 = 4x^2$$
$$3x^2 = 64$$
$$x^2 = \frac{64}{3} \Rightarrow x = \frac{8}{\sqrt{3}} = \frac{8\sqrt{3}}{3}$$

$$AB = \frac{8\sqrt{3}}{3}$$
$$BC = \frac{16\sqrt{3}}{3}$$

(3)



a) $\theta = 45° \Rightarrow$ the terminal side of θ is on the bisector line $y = x$

Let $P(1,1)$

(OR, Let $P(x,y)$ on terminal side and ΔPQO is a $45°-45°-90°$)

b) ΔOPQ: Pythagorean th:

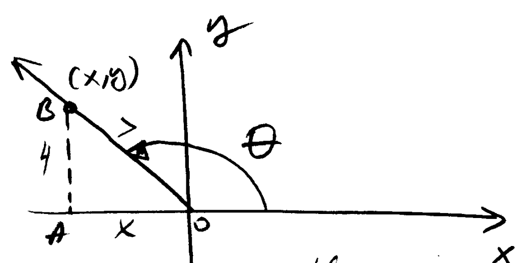
$$(OQ)^2 + (QP)^2 = (OP)^2$$
$$1^2 + 1^2 = (OP)^2$$
$$OP = \sqrt{2}$$

c) coterminal angles with θ:

$\alpha = -315°$ $\quad (-(360° - 45°))$

$\beta = 405°$ $\quad (360° + 45°)$

(4)



Let (x,y) a point on the terminal side of θ

$$\sin\theta = \frac{4}{7}$$
also
$$\sin\theta = \frac{y}{r}$$

let $y = 4$, $r = 7$

ΔAOB: Pythagorean theorem

$$x^2 + 4^2 = 7^2$$
$$x^2 = 33 \Rightarrow x = \pm\sqrt{33}$$

but $(x,y) \in II$

so $x = -\sqrt{33}$

Then, $\cos\theta = \frac{x}{r} = \frac{-\sqrt{33}}{7}$

$\tan\theta = \frac{y}{x} = \frac{4}{-\sqrt{33}} = -\frac{4\sqrt{33}}{33}$

$\cot\theta = \frac{1}{\tan\theta} = \frac{-\sqrt{33}}{4}$

$\csc\theta = \frac{1}{\sin\theta} = \frac{7}{4}$

$\sec\theta = \frac{1}{\cos\theta} = \frac{-7}{\sqrt{33}} = \frac{-7\sqrt{33}}{33}$

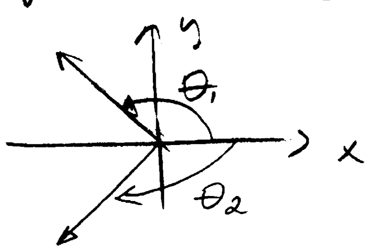
(5) (a)

$\cos\theta < 0$

$\cos\theta = \frac{x}{r} < 0$ iff $x < 0$

$r > 0$

Therefore, $\theta \in$ II or III

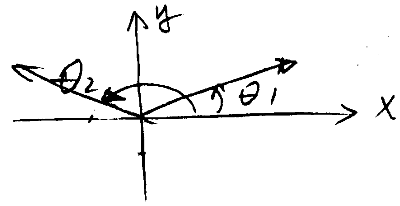


(b) $\sin\theta > 0$

$\sin\theta = \frac{x}{r} > 0$ iff $x > 0$

$r > 0$

Therefore, $\theta \in$ I or II



(c) $\tan\theta < 0$

$\tan\theta = \frac{y}{x} < 0$ iff

x and y have opposite signs

Therefore, $\theta \in$ II or IV