Dawson College Department of Mathematics

Instructor: M. Ishii

201-941-DW Engineering Math I   Name: *ANSWERS*

Final Exam   Student ID: _____

Fall 2019

Time Limit: 3 hours

- Each question is worth 10 marks, and all lengths are in millimeters. Keep 4 decimal places.

- Attempt EVERY question and show all your work. Please circle your final answers.

- If you need more space, use the back of the pages; clearly indicate when you have done this.

- Only the calculators Sharp EL-531X, EL-531XG and EL-531XT are permitted.

- This exam booklet must be returned intact.

Problem	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
Total:	100	

Formulas:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}, \quad \text{Arclength (rad)} = R\theta, \quad \text{Arclength (deg)} = R\theta\left(\frac{\pi}{180}\right)$$

$$\text{Sector area (rad)} = \frac{\theta R^2}{2}, \quad \text{Sector area (deg)} = \frac{\theta R^2}{2}\left(\frac{\pi}{180}\right), \quad a^2 = b^2 + c^2 - 2bc\cos A$$

1. Solve the following systems using Gauss-Jordan Elimination:

   (a) (5 marks) Solve the following system: $\begin{cases} 3x - 4y + 4z = 7 \\ x - y - 2z = 2 \\ 2x - 3y + 6z = 5 \end{cases}$

$z = t \in \mathbb{R}$

$y = 10t - 1$

$x = 12t + 1$

   (b) (5 marks) A company places an order for nuts, bolts and washers. The total number of all pieces is 2800. The number of nuts and bolts combined is 1800 more than the number of washers. The number of bolts is three times the number of washers. How many of each were ordered?
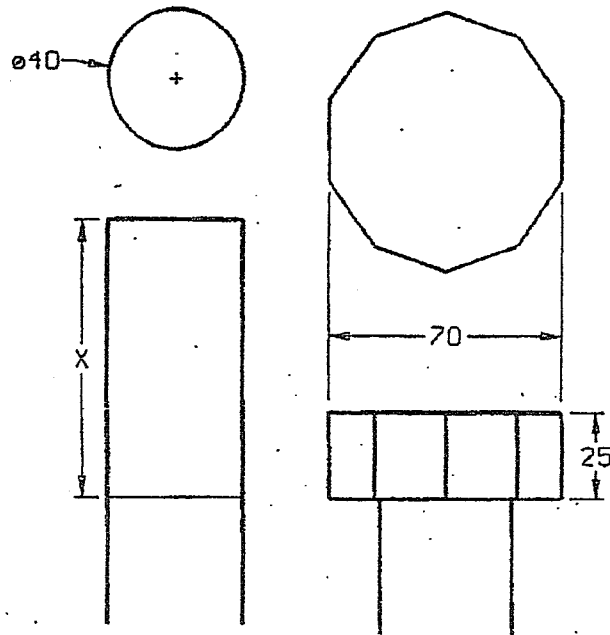
800 nuts

1500 bolts

500 washers

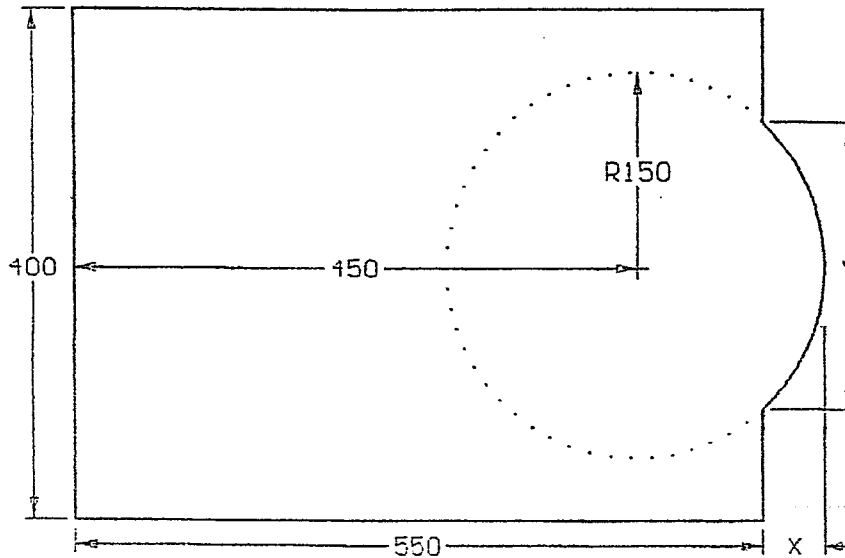2. (10 marks) Find the diameter X and clearance Y.
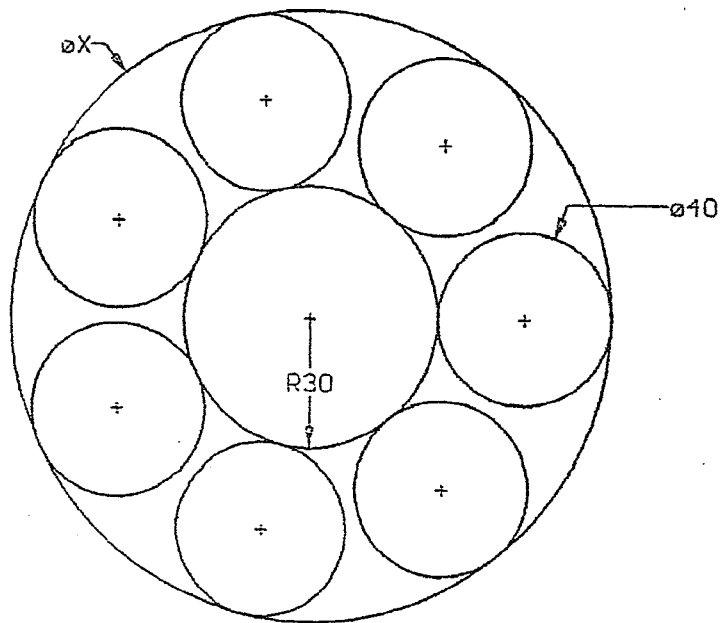
$X = 140$ mm

$Y = 3.3884$ mm

3. (10 marks) Find the length of the piece of stock needed to stamp the bolthead.

ø40

70

25

X

X = 79.1849 mm

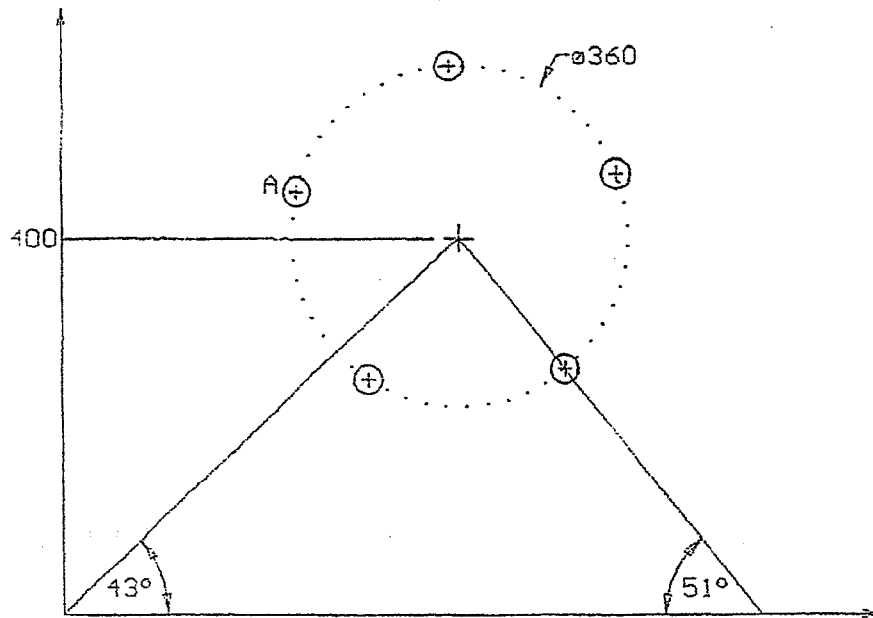4. (10 marks) Find the lengths X and Y, AND find the area of the baseplate.
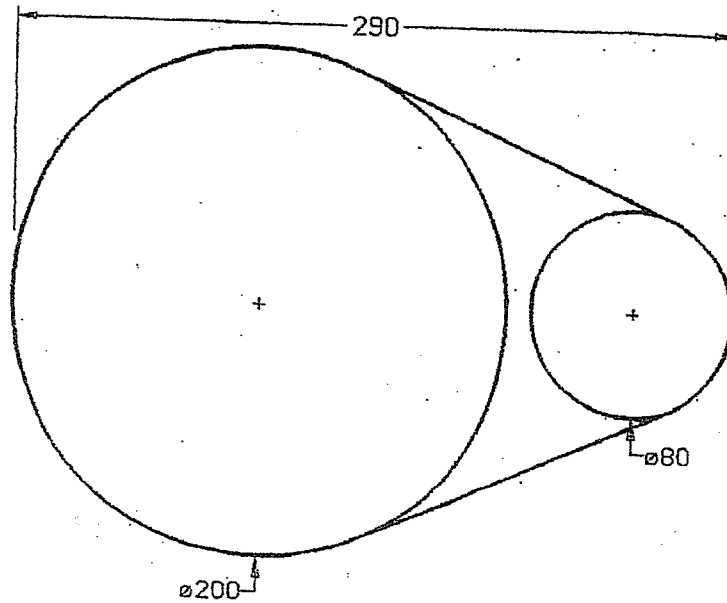

$X = 50 \text{mm}$

$Y = 223.6068 \text{mm}$

$\text{Area} = 227743.7052 \text{ mm}^2$
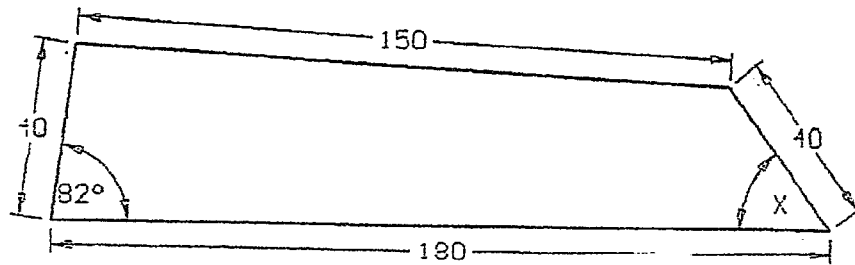
5. (10 marks) Find the coordinates of point A:

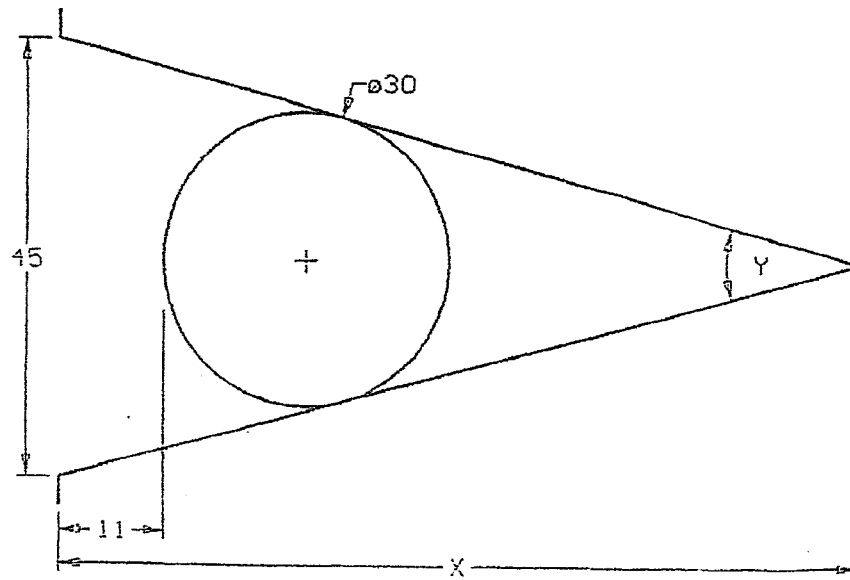
A (255.0809, 446.5874)

6. (10 marks) Find the beltlength:

Beltlength
764.1555 mm

7. (10 marks) Find the angle X:

$$X = 51.9526°$$

8. (10 marks) Find the values of X and Y:

$$X = 83.9274 \text{ mm}$$

$$Y = 30.0149°$$

9. (a) (5 marks) Find the radius and center of the circle with equation: $x^2 + y^2 - 6x + 10y = -9$

Radius = 5

Center = $(3, -5)$

(b) (5 marks) Simplify, with only positive exponents: $\dfrac{(5z)^{-1}x^{-2}y^3}{y^5(3x^3z)^2}$

$$\frac{1}{45\, x^8 y^2 z^3}$$

10. Solve the following equations for x:

(a) (5 marks) $\log(x+5) + \log(x+2) = \log(x+6)$

$$x = -0.7639$$

(b) (5 marks) $\dfrac{2x}{x-1} + \dfrac{x-5}{x^2-1} = 1$

$$x = -4$$