



C1: Short answer. Show no work.

Please write **DNE** in a blank if the described object does not exist or if the indicated operation cannot be performed.

a

A real number which is *not* transcendental is circle

arthritic astringent irrational isometric acerbic chiral
pedestrian polyhedral asthmatic algebraic tardy

b

Points $P := (1, 2)$, $Q := (6, 2)$ and $R := (9, 2)$ are collinear, with P and R lying on a circle with center \mathcal{O} and radius r . And $\text{Dist}(Q, \mathcal{O}) = 2$. So $r =$.

c

Matrix $\mathbf{M} := \begin{bmatrix} a & b & v \\ c & d & w \\ 0 & 0 & 1 \end{bmatrix}$ rotates the plane CCW about

point $Q := (5, 2)$, by 90° . So $\begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} \text{.....} & \text{.....} \\ \text{.....} & \text{.....} \end{bmatrix}$.

Importantly, $v =$ and $w =$. [Hint: \mathbf{M} acts, from the left, on column-vectors $\begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$. And \mathbf{M} fixes Q .]

OYOP: In grammatical English **sentences**, write your essay on every **third** line (usually), so that I can easily write between the lines.

C2: Consider a triangle $\mathbf{S} := \triangle ABC \subset \mathbb{R}^2$.

i

For a point $Q \in \mathbb{R}^2$, define the **pedal triangle** $\text{Ped}_{\mathbf{S}}(Q)$. Draw an example where \mathbf{S} is obtuse and: Q lies outside of \mathbf{S} , and another example with Q inside \mathbf{S} .

ii

Carefully state the **Simson-line theorem**. Include a picture to show the idea.

iii

Write a careful **proof** of the **Simson-line thm**. Illustrate the steps in your (written) proof with (large) illustrations. Carefully identify each cyclic quadrilateral (abbrev. "CQuad") that you use.

Start next essay on a new sheet-of-paper.

C3: Given a triangle $\triangle PQR$, describe a compass-and-straightedge construction of its in-circle, Ω . Show how to construct $\mathcal{O} := \text{Center}(\Omega)$, as well as a point V st. $\text{Dist}(V, \mathcal{O}) = \text{Radius}(\Omega)$.

End of Class-C

C1: 80pts

C2: 95pts

C3: 45pts

Not triple-spaced: -15pts

Ouch!, scratch work
handed-in : -5pts

Total: 220pts

Please PRINT your name and ordinal. Ta:

Ord:

HONOR CODE: "I have neither requested nor received help on this exam other than from my professor."

Signature: