Math Document Template

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***Abstract*—This is a document explaining for a question on the concept of area of a quadrilateral.**

Download all python codes from

```
svn co https://github.com/Ashuwin/summer_20/
    trunk/linalg_quad/codes
```

and latex-tikz codes from

```
svn co https://github.com/Ashuwin/summer_20/
    trunk/linalg_quad/figs
```

1 Problem

Find the area of the quadrilateral whose vertices are, taken in order, are $\begin{pmatrix}-4\\2\end{pmatrix}, \begin{pmatrix}-3\\-5\end{pmatrix}, \begin{pmatrix}3\\-2\end{pmatrix}, \begin{pmatrix}2\\3\end{pmatrix}$

2 Construction

2.1. The design parameters used for construction solution See Table. 2.1.

Design Parameters	
Parameters	Value
A	$\begin{pmatrix}-4\\2\end{pmatrix}$
B	$\begin{pmatrix}-3\\-5\end{pmatrix}$
C	$\begin{pmatrix}3\\-2\end{pmatrix}$
D	$\begin{pmatrix}2\\3\end{pmatrix}$

TABLE 2.1: Quadrilateral $ABCD$

2.2. Draw fig. 2.2.
Solution: The following Python code generates Fig. 2.2

```
codes/quad.py
```

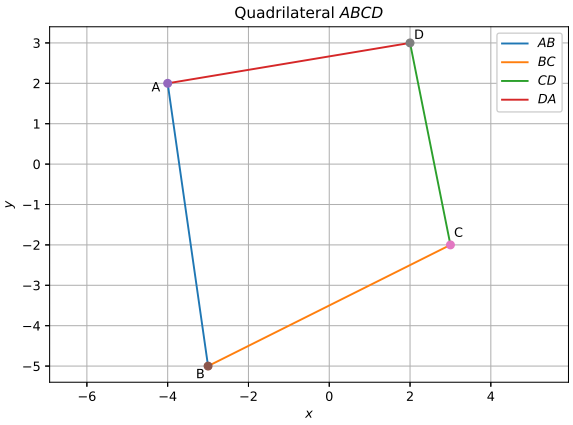

Fig. 2.2: Quadrilateral $ABCD$ using python

3 Solution

3.1. The area of triangle ABC:
Solution: The area of triangle ABC using cross product is obtained as:

$$\frac{1}{2}\|(\mathbf{B}-\mathbf{A})\times(\mathbf{C}-\mathbf{A})\|$$

and it is found in the following python code:

```
codes/tri_area_ABC.py
```

Area of $\triangle ABC = 22.5 units^2$

3.2. The area of triangle ACD:
Solution: The area of triangle ACD using Heron's formula is obtained as:

$$\frac{1}{2}\|(\mathbf{C}-\mathbf{A})\times(\mathbf{D}-\mathbf{A})\|$$

and it is found in the following python code:

```
codes/tri_area_ACD.py
```

Area of $\triangle ACD = 15.5 units^2$

3.3. The area of quadrilateral $ABCD$:
Solution: Area of Quadrilateral $ABCD$ = Area of $\triangle ABC$ + Area of $\triangle ACD = 38 units^2$