1.5.29

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Question

The coordinates of the point P dividing the line segment joining the points A (1, 3) and B (4, 6), in the ratio 2 : 1 are

Equation

The formula for internal division of vectors is where P divides A and B in the ratio k:1

$$P = kB + A\frac{}{1+k}$$

Theoretical Solution

According to the question,
Consider the coordinate as following vectors

Given the points A and B

$$\mathbf{A} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 4 \\ 6 \end{pmatrix}$$

Thus by formula

$$\mathbf{P} = \frac{1}{1+2}\left(\begin{pmatrix} 1 \\ 3 \end{pmatrix} + 2\begin{pmatrix} 4 \\ 6 \end{pmatrix}\right)$$

$$\mathbf{P} = \frac{1}{3}\left(\begin{pmatrix} 1 \\ 3 \end{pmatrix} + \begin{pmatrix} 8 \\ 12 \end{pmatrix}\right)$$

$$\mathbf{P} = \frac{1}{3}\begin{pmatrix} 9 \\ 15 \end{pmatrix}$$

C Code - Section formula function

```c
// section_formula.c
#include <stdio.h>

void find_section_point(double x1, double y1, double x2, double
    y2, double m, double n, double* x, double* y) {
        *x = (m * x2 + n * x1) / (m + n);
        *y = (m * y2 + n * y1) / (m + n);
}
```

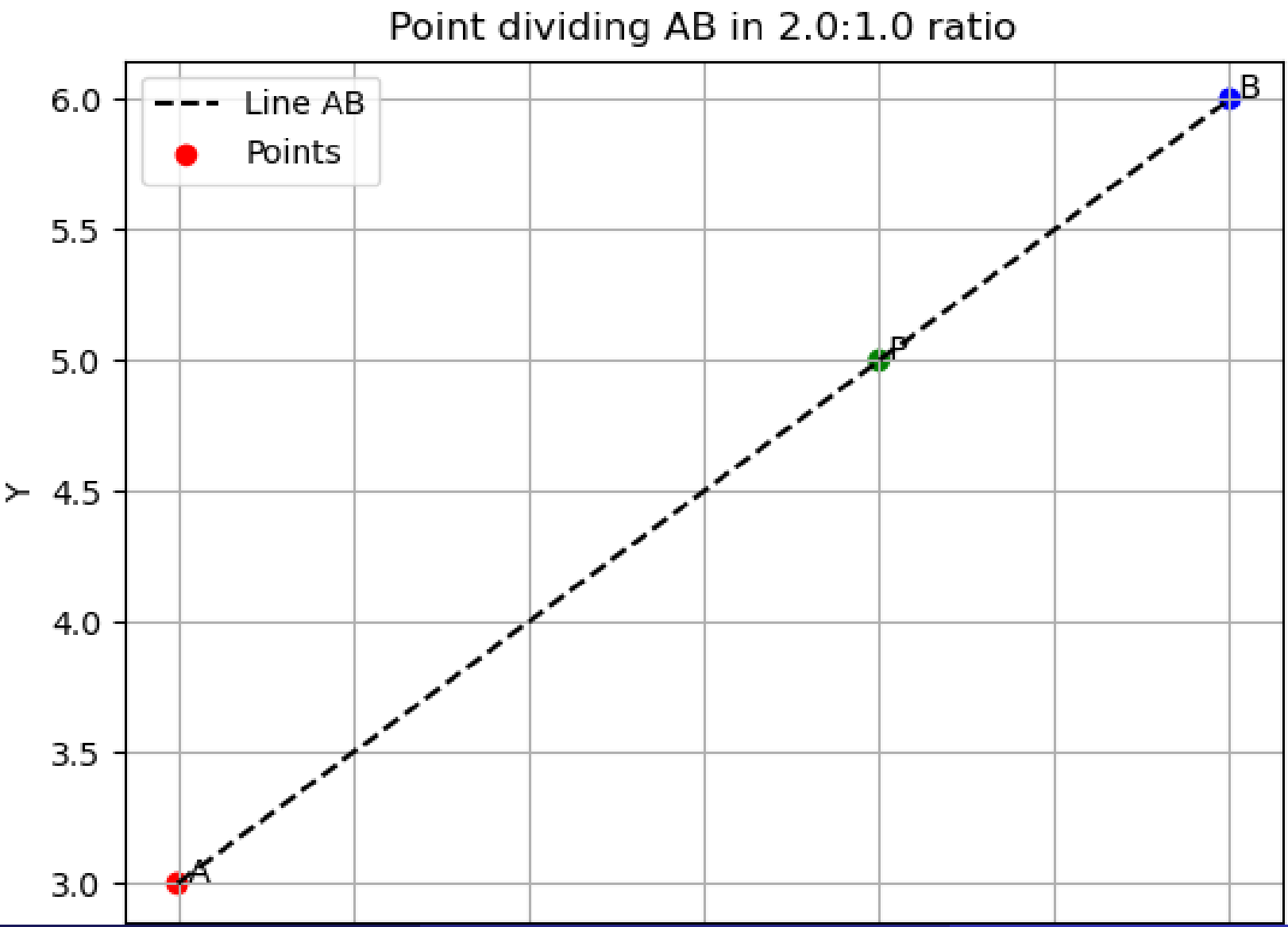
Python Code through shared output

```
import ctypes
import numpy as np
import matplotlib.pyplot as plt

# Load the shared library
lib = ctypes.CDLL(./line_division.so)

# Define argument and return types
lib.divide_point.argtypes = [ctypes.c_float, ctypes.c_float,
    ctypes.c_float, ctypes.c_float,
ctypes.c_float, ctypes.c_float,
np.ctypeslib.ndpointer(dtype=np.float32, ndim=1, flags=
    C_CONTIGUOUS)]
lib.divide_point.restype = None

# Given points A and B
x1, y1 = 1.0, 3.0 # Point A
x2, y2 = 4.0, 6.0 # Point B
```

Python code : Direct

```
import sys
import numpy as np
import numpy.linalg as LA
import matplotlib.pyplot as plt
import matplotlib.image as mpimg

#local imports
from libs.line.funcs import *
from libs.triangle.funcs import *
from libs.conics.funcs import circ_gen




#Given points
A = np.array(([1,3])).reshape(-1,1)
B = np.array(([4,6])).reshape(-1,1)

#Ratio
n=2/1
```

Plot by python using shared output from c



Plot by python only