Worksheet 02

In [1]:
```
from sympy import *
from sympy.geometry import Line, Segment
from sympy.plotting import plot, plot3d
import matplotlib.pyplot as plt
%matplotlib inline

plt.rcParams['figure.figsize'] = 10, 10
init_printing()
x, y, a, b = symbols('x y a b')
```

11. An equation of line ℓ, which has (3, 0) and (0, 4)

$(A)\ 3x - 4y - 4 = 0$
$(B)\ 3x + 4y - 4 = 0$
$(C)\ 4x - 3y - 4 = 0$
$(D)\ 4x + 3y + 12 = 0$
$(E)\ 4x + 3y - 12 = 0$

Solution

- By my work

$$y = \frac{0-4}{3-0}(x-3)$$
$$= -\frac{4}{3}(x-3)$$

$$3y = -4(x-3)$$
$$3y = -4x - 12$$
$$4x + 3y - 12 = 0$$

- By Sympy

In [2]:
```
L = Line(Point(3, 0), Point(0, 4))
eq = Eq((-1)*L.equation())
eq
```

Out[2]: $4x + 3y - 12 = 0$

Answer: (E)

12. The mean score of 10 students of an algebra class was 85. When two new students enrolled, the mean inscreased to 86. What was the average of the new students?

$(A)\ 88$
$(B)\ 89$
$(C)\ 90$
$(D)\ 91$
$(E)\ 92$

Solution

- By my work

Set the new students average score is A_{new}

$$\sum_{k=1}^{10} S_{10} = 85 * 10 = 850$$

$$\sum_{k=1}^{10} S_{10} + \sum_{k=1}^{2} S_{new} = 850 + 2 * A_{new} = 86 * 12 = 1032$$

$$850 + 2 * A_{new} = 1032$$

$$A_{new} = \frac{1032 - 850}{2} = 91$$

- By SymPy

In [3]:
```
eq = Eq(85*10+2*a, 86*12)
eq
```

Out[3]: $2a + 850 = 1032$

In [4]:
```
solve(eq, a)
```

Out[4]: $[91]$

Answer: (D)

3. If $\sin\theta + cos\theta = \frac{1}{2}$, then $\tan\theta + \cot\theta =$

$(A)\ -4.12$
$(B)\ -2.67$
$(C)\ -1.35$
$(D)\ 2.67$
$(E)\ 4.12$

Solution

- By my work

- Find out $\sin\theta\cos\theta$ =

$$\sin\theta+\cos\theta=\frac{1}{2}$$
$$(\sin\theta+\cos\theta)^2=(\frac{1}{2})^2$$
$$\sin\theta^2+2\sin\theta\cos\theta+\cos\theta^2=\frac{1}{4}$$
$$2\sin\theta\cos\theta+\sin\theta^2+\cos\theta^2=\frac{1}{4}$$
$$2\sin\theta\cos\theta+1=\frac{1}{4}$$
$$\sin\theta\cos\theta=\frac{-1+\frac{1}{4}}{2}=-\frac{3}{8}$$

- Find out $\tan\theta+\cot\theta$ =

$$\begin{aligned}\tan\theta+\cot\theta&=\frac{\sin\theta}{\cos\theta}+\frac{\cos\theta}{\sin\theta}\\&=\frac{\sin\theta^2+\cos\theta^2}{\sin\theta\cos\theta}\\&=\frac{1}{\sin\theta\cos\theta}\\&=\frac{1}{-\frac{3}{8}}\\&=-\frac{8}{3}\\&=-2.67\end{aligned}$$

- By SymPy

In [ ]: