Math Document Template

C ANISH

***Abstract*—This is a document explaining a question about the concept of finding the roots of a linear equation.**

Download all python codes from

```
svn co https://github.com/chakki1234/summer
    -2020/trunk/linearalg/codes
```

and latex-tikz codes from

```
svn co https://github.com/chakki1234/summer
    -2020/trunk/linearalg/figs
```

1 Problem

Find the zero of the polynomial in each of the following cases:

$$p(x) = x + 5$$
$$p(x) = x - 5$$
$$p(x) = 2x + 5$$
$$p(x) = 3x - 2$$
$$p(x) = 3x$$

2 Construction

2.1. Draw Fig. 3.1, 3.2, 3.3, 3.4, 3.4 .

Solution: The following Python code generates all the figures.

```
codes/linear_eq_roots.py
```

3 Solution

3.1. **Solution:** For $p(x) = x + 5$

The given equation can be represented as follows in the vector form:

$$\begin{pmatrix} 5 & -1 \end{pmatrix} x + 5 = 0 \tag{3.1.1}$$

To find the roots $y = 0$:

$$x + 5 = 0 \tag{3.1.2}$$
$$x = -5 \tag{3.1.3}$$

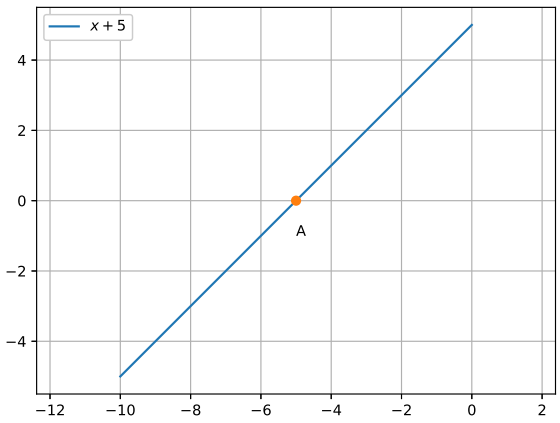

Fig. 3.1: $x + 5$ generated using python

3.2. **Solution:** For $p(x) = x - 5$

The given equation can be represented as follows in the vector form:

$$\begin{pmatrix} 5 & -1 \end{pmatrix} x - 5 = 0 \tag{3.2.1}$$

To find the roots $y = 0$:

$$x - 5 = 0 \tag{3.2.2}$$
$$x = 5 \tag{3.2.3}$$

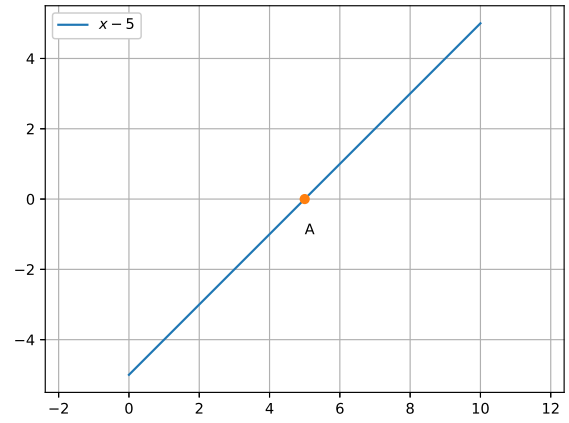

Fig. 3.2: $x-5$ generated using python

3.3. **Solution:** For $p(x) = 2x + 5$

The given equation can be represented as follows in the vector form:

$$\begin{pmatrix} 2 & -1 \end{pmatrix} x + 5 = 0 \tag{3.3.1}$$

To find the roots $y = 0$:

$$2x + 5 = 0 \tag{3.3.2}$$

$$x = \frac{-5}{2} \tag{3.3.3}$$

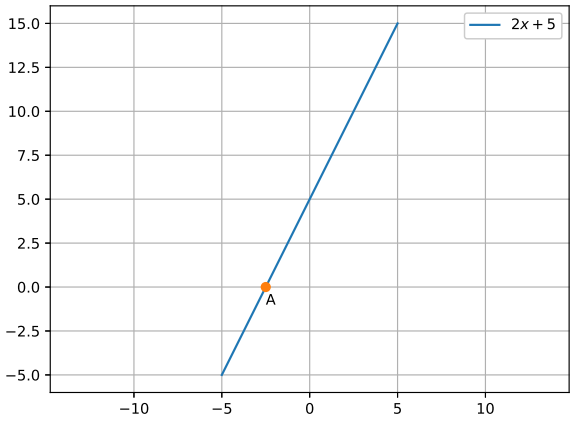

Fig. 3.3: $2x + 5$ generated using python

3.4. **Solution:** For $p(x) = 3x - 2$

The given equation can be represented as follows in the vector form:

$$\begin{pmatrix} 3 & -1 \end{pmatrix} x - 2 = 0 \tag{3.4.1}$$

To find the roots $y = 0$:

$$3x - 2 = 0 \tag{3.4.2}$$

$$x = \frac{2}{3} \tag{3.4.3}$$

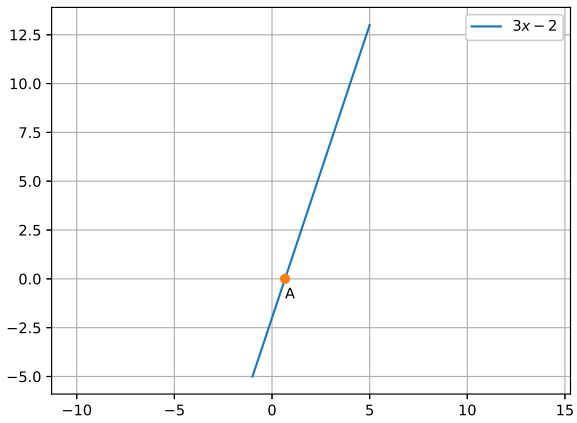

Fig. 3.4: $3x - 2$ generated using python

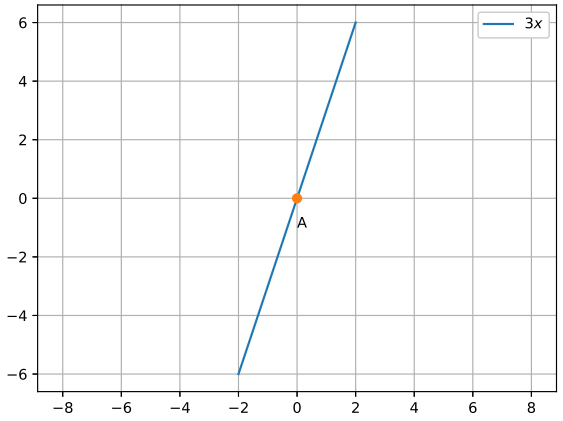

Fig. 3.4: $3x$ generated using python

3.5. **Solution:** For $p(x) = 3x$

The given equation can be represented as follows in the vector form:

$$\begin{pmatrix} 3 & -1 \end{pmatrix} x = 0 \tag{3.5.1}$$

To find the roots $y = 0$:

$$3x = 0 \tag{3.5.2}$$

$$x = 0 \tag{3.5.3}$$