Assignment6-1

October 12, 2024

0.1 Assignment 6

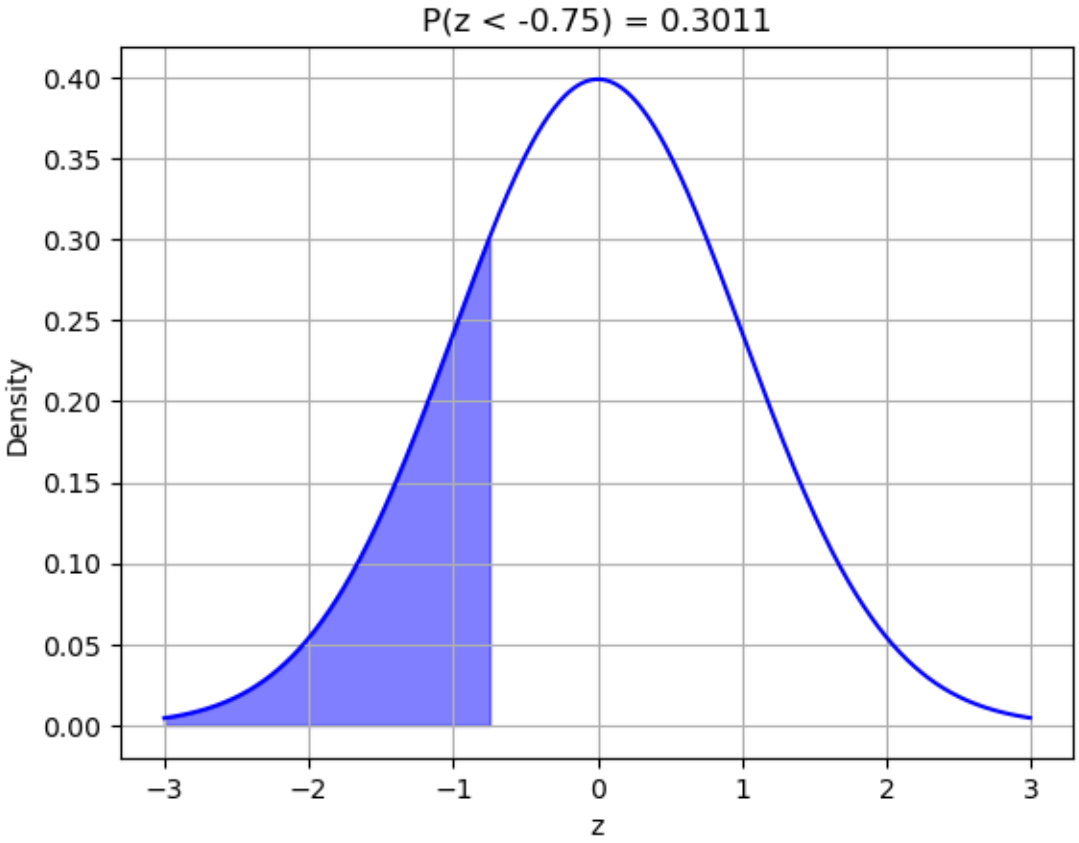
1) Fill in the function "plot_std_normal_with_probability()" to draw the standard normal distribution curve.

[29]:
```
import numpy as np
import matplotlib.pyplot as plt
from scipy.stats import norm
```

[31]:
```
def plot_std_normal_with_probability(title, x, interval_1):
    """
    Plot the standard normal curve with a filled-in area under
    the curve within one or two intervals of the x values.
    @param title the title of the graph.
    @param x the range of x values to graph.
    @param interval_1 one interval of the range.
    """

    plt.plot(x, norm.pdf(x), color='blue')

    if isinstance(interval_1, (list, tuple)) and len(interval_1) == 2:

        plt.fill_between(x, 0, norm.pdf(x), where=(x > interval_1[0]) & (x <␣
↪interval_1[1]), color='blue', alpha=0.5)
    else:

        plt.fill_between(x, 0, norm.pdf(x), where=(x < interval_1),␣
↪color='blue', alpha=0.5)

    plt.title(title)
    plt.xlabel('z')
    plt.ylabel('Density')
    plt.grid(True)
    plt.show()
```

[33]:
```
x = np.arange(-3, 3, 0.01)
```

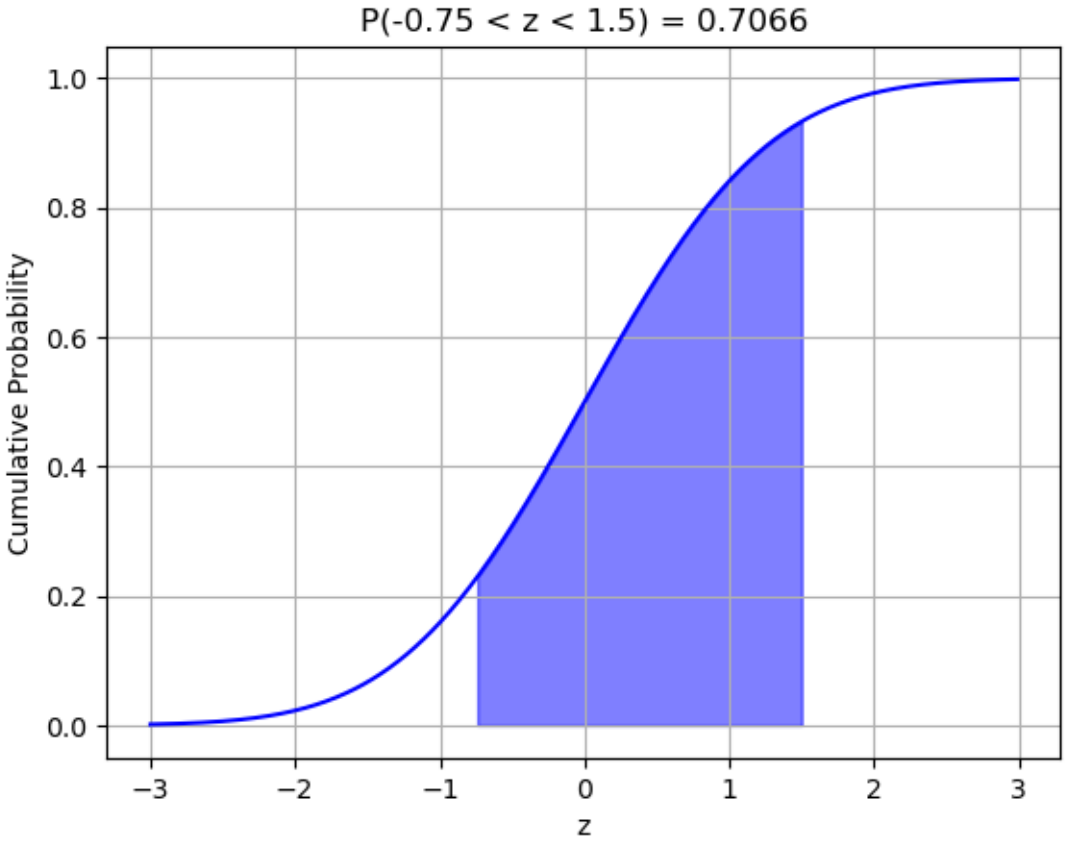
[35]:
```
z0 = -0.75
p = norm.pdf(z0)
plot_std_normal_with_probability(f'P(z < {z0}) = {p:.4f}', x, z0)
```



2) Use norm.cdf() and plot_std_normal_with_probability() to draw the standard normal distribution in the following area and draw the corresponding graph in Python. P(-0.75 < z < 1.5) = 0.7066

[37]:
```
z_lower = -0.75
z_upper = 1.5
p_between = norm.cdf(z_upper) - norm.cdf(z_lower)

# Plot the CDF directly
plt.plot(x, norm.cdf(x), color='blue')

# Fill between z_lower and z_upper using CDF
plt.fill_between(x, 0, norm.cdf(x), where=(x > z_lower) & (x < z_upper),␣
 ↪color='blue', alpha=0.5)

# Add titles and labels
```

```
plt.title(f'P({z_lower} < z < {z_upper}) = {p_between:.4f}')
plt.xlabel('z')
plt.ylabel('Cumulative Probability')
plt.grid(True)
plt.show()
```



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