Shweta_Shinde_Math_Assignment6

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0.2 Assignment 6

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

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

```python
[10]: 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.
          """
          y = norm.pdf(x)  # Probability density function of standard normal

          plt.plot(x, y)

          # Fill the area under the curve where interval_1 is True
          plt.fill_between(x, 0, y, where=interval_1, color='blue', alpha=0.5)

          # Add title and labels
          plt.title(title)


          # Show the plot
          plt.show()

      x = np.arange(-3, 3, 0.01)
      z0 = -0.75
      p = norm.cdf(z0)
      plot_std_normal_with_probability(f'P(z < {z0}) = {p:.4f}', x, x < z0)
```
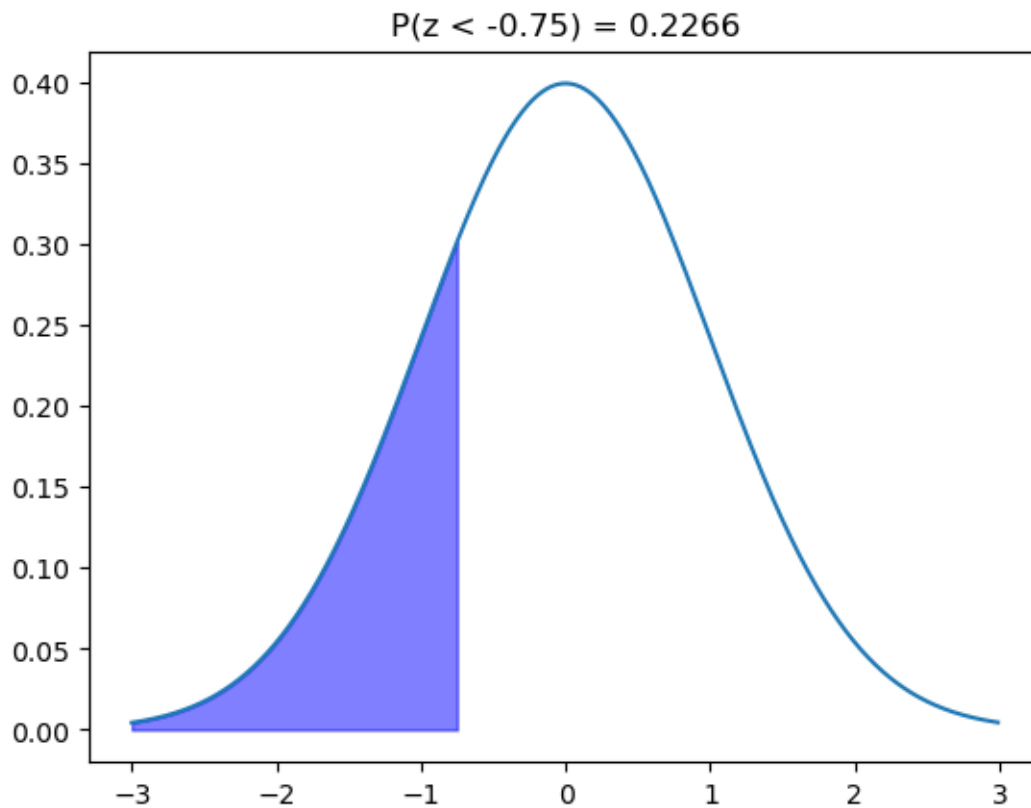
```
#if z0 = -0.75, then interval_1 will be True for all values of x less than -0.
 ↪75 and
#False for values of x greater than or equal to -0.75.
```

P(z < -0.75) = 0.2266

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

```
[20]: def plot_std_normal_with_probability(title, x, interval_1):
          """
          Plots the standard normal curve with a shaded area under the curve
          within the specified interval.

          Parameters:
          title (str): The title of the graph.
          x (numpy.ndarray): The range of x (z) values to graph.
          interval_1 (numpy.ndarray): Boolean array indicating the region to shade.

          """
          # Plot the standard normal distribution (PDF)
          pdf = stats.norm.pdf(x)
```

```python
    # Plot the standard normal distribution curve
    plt.plot(x, pdf)

    # Fill the area under the curve where interval_1 is True
    plt.fill_between(x, 0, pdf, where=interval_1, color='blue', alpha=0.5)

    # Add title
    plt.title(title)

    # Show the plot
    plt.show()

# Example usage:

# Define the range of x values
x = np.arange(-3, 3, 0.01)

# Define the z-values for the interval (-0.75, 1.5)
z_min = -0.75
z_max = 1.5

# Boolean array to indicate the area to shade (between z_min and z_max)
interval_1 = (x >= z_min) & (x <= z_max)

# Calculate the probability between z_min and z_max using norm.cdf()
probability = stats.norm.cdf(z_max) - stats.norm.cdf(z_min)

# Plot the standard normal distribution with the shaded area
plot_std_normal_with_probability(f'P({z_min} < z < {z_max}) = {probability:.
  ↪4f}', x, interval_1)
```
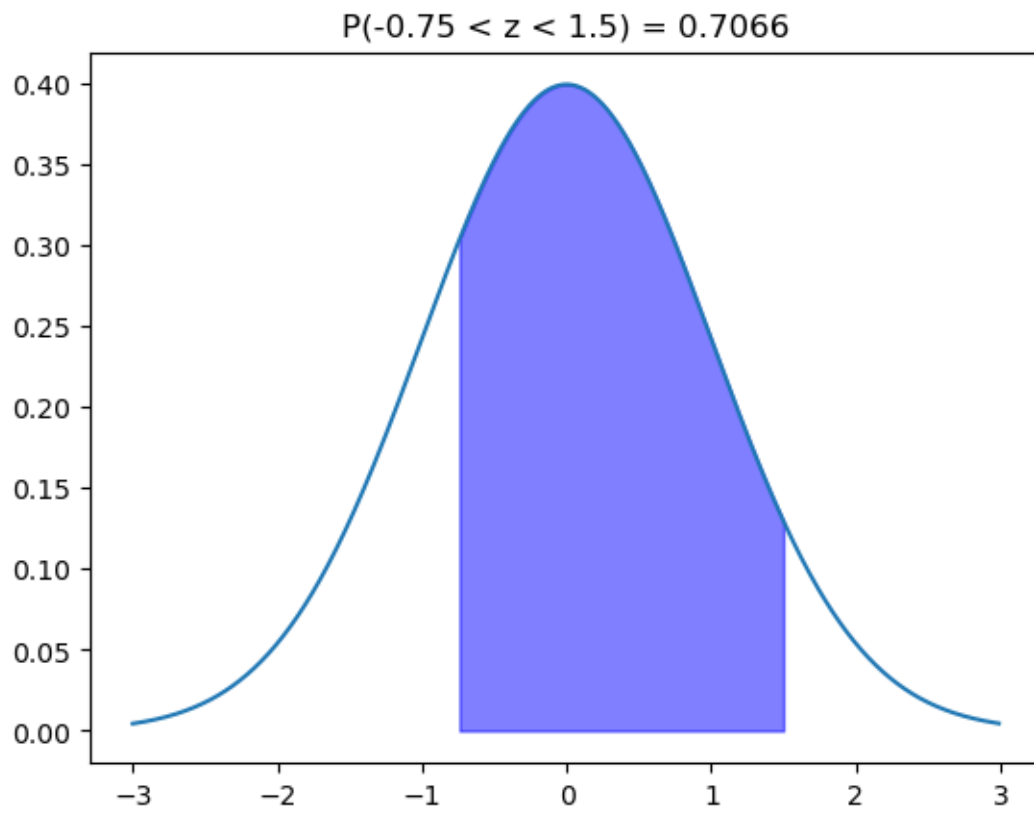
P(-0.75 < z < 1.5) = 0.7066

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