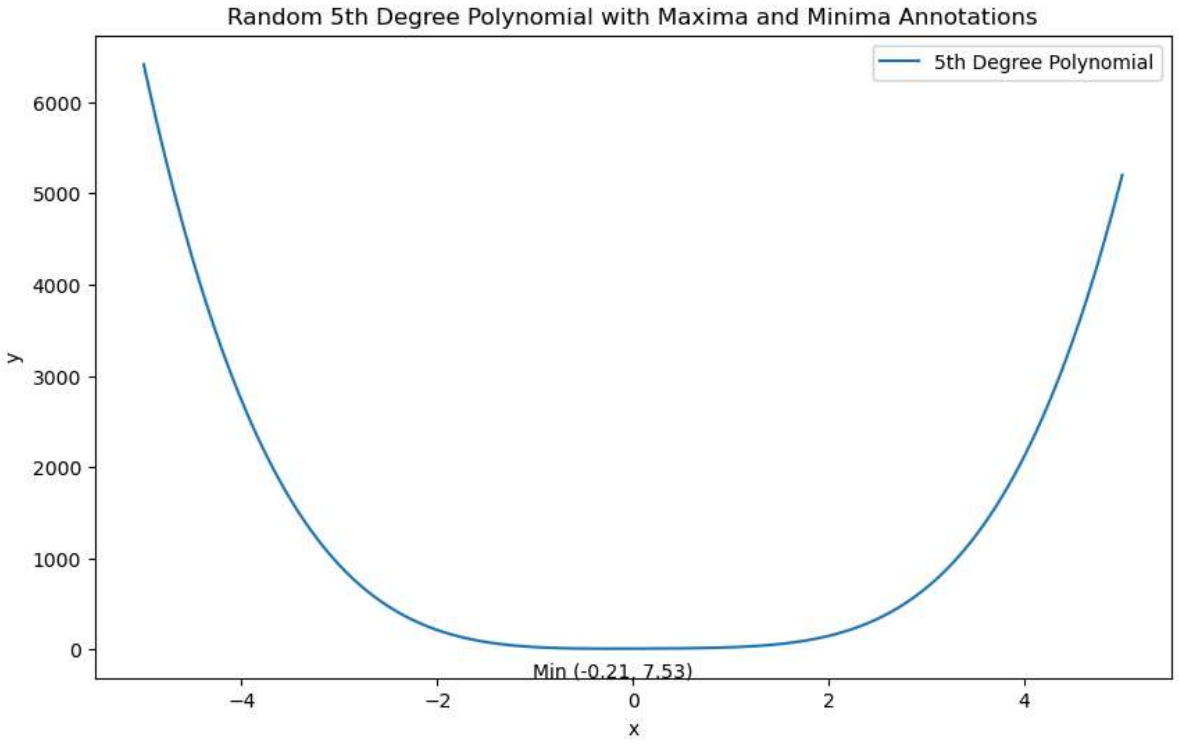
Q4. Polynomial Plotting with Annotations:

Randomly select the coefficients of a 5th degree polynomial. Set the random seed as the last two digits of your roll number. Plot the polynomial for -5 ≤ x ≤ 5. Annotate the plot to identify the maxima and minima of the polynomial.

In [2]:

```
import numpy as np
import matplotlib.pyplot as plt
import sympy as sp
roll_number = 18
np.random.seed(roll_number)
coefficients = np.random.randint(-10, 10, size=6)
def polynomial(x, coeffs):
    return sum(c * x**i for i, c in enumerate(coeffs[::-1]))
x_values = np.linspace(-5, 5, 500)
y_values = polynomial(x_values, coefficients)
plt.figure(figsize=(10, 6))
plt.plot(x_values, y_values, label='5th Degree Polynomial')
dy_dx = np.gradient(y_values, x_values)
maxima_indices = (np.diff(np.sign(dy_dx)) < 0).nonzero()[0] + 1
minima_indices = (np.diff(np.sign(dy_dx)) > 0).nonzero()[0] + 1
maxima_x = x_values[maxima_indices]
maxima_y = y_values[maxima_indices]
minima_x = x_values[minima_indices]
minima_y = y_values[minima_indices]
for x, y, label in zip(maxima_x, maxima_y, maxima_x):
    plt.annotate(f'Max ({label:.2f}, {y:.2f})', (x, y),textcoords="offset
for x, y, label in zip(minima_x, minima_y, minima_x):
    plt.annotate(f'Min ({label:.2f}, {y:.2f})', (x, y),textcoords="offset
plt.xlabel('x')
plt.ylabel('y')
plt.title('Random 5th Degree Polynomial with Maxima and Minima Annotations
plt.legend()
plt.show()
```



In [ ]:
```
1
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