Lab 11 - Newton's Divided Difference Interpolation Formula

Task 1

```
% Newton Divided Difference Interpolation
% This script calculates the interpolated value of f(6) using the Newton
% Divided Difference Formula given specific data points.

% Define the x values and f(x) values
x = [5, 7, 11, 13, 21];
fx = [150, 392, 1452, 2366, 9702];

% Number of points
n = length(x);

% Create a matrix for divided differences
div_diff = zeros(n, n);

% Initialize the first column with f(x) values
div_diff(:, 1) = fx';

% Compute the divided differences
for j = 2:n
    for i = 1:n-j+1
        div_diff(i, j) = (div_diff(i+1, j-1) - div_diff(i, j-1)) / (x(i+j-1)
- x(i));
    end
end

% Calculate the value of the interpolating polynomial at x = 6
target_x = 6;
result = div_diff(1, 1);  % Start with the first term of the polynomial
which is f(x0)
multiplier = 1.0;

for i = 2:n
    multiplier = multiplier * (target_x - x(i-1));
    result = result + div_diff(1, i) * multiplier;
end

% Display the result
fprintf('The interpolated value f(6) is approximately %.2f\n', result);
```

```
The interpolated value f(6) is approximately 252.00
```

Task 2

```
% Define the x values and f(x) values
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x = [0, 1, 2, 5];
fx = [2, 3, 12, 147];

% Fit a polynomial of degree 3
p = polyfit(x, fx, 3);

% Define a new x value to compute f(x)
new_x = 3;

% Compute f(new_x) using the fitted polynomial
new_fx = polyval(p, new_x);

% Display the coefficients of the polynomial
disp('The coefficients of the polynomial are:');
```

```
The coefficients of the polynomial are:
```

```
disp(p);
```

```
    1.0000    1.0000   -1.0000    2.0000
```

```

% Display the computed f(x)
fprintf('The value of f(%d) is %.2f\n', new_x, new_fx);
```

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The value of f(3) is 35.00
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