Given $f(x) = 3x^4 - 5x^3 + 8x^2 - 7x + 10$

Find f(2)

You can do this one of four ways:

1. Substitute 2 for x and evaluate
2. Synthetic Division.
   f(2) will be the remainder
3. Long Division with divisor of (x-2).
   f(2) will be the remainder
4. Division with (x-2) using the "Box".
   f(2) will be the remainder.

$$\begin{array}{r|rrrrr} 2 & 3 & -5 & 8 & -7 & 10 \\ & & 6 & 2 & 20 & 26 \\ \hline & 3 & 1 & 10 & 13 & 36 \end{array}$$

$\longrightarrow$ Remainder = 36

Given $(x+2)$ & $(x+3)$ are factors of $x^4 + 2x^3 - 13x^2 - 38x - 24$, use Synthetic Division to find the other two factors.

$$\begin{array}{r|rrrrr} -2 & 1 & 2 & -13 & -38 & -24 \\ & & -2 & 0 & 26 & 24 \\ \hline -3 & 1 & 0 & -13 & -12 & 0 \\ & & -3 & 9 & 12 & \\ \hline & 1 & -3 & -4 & 0 & \end{array}$$

$x^2 - 3x - 4 \longrightarrow$ Factor this Quadratic

$$\begin{array}{ccc} & -4 & \\ -4 & \times & +1 \\ & -3 & \end{array}$$

The four factors are: $\boxed{(x-4)(x+1)(x+2)(x+3)}$

You can now finish Hwk #32: Sec 6-3

Pages 324

Problems 14, 15, 24,26, 27, 50, 51

Due Tomorrow

Find the next two rows of this pattern.

1

1 1

1 2 1

1 3 3 1

1 4 6 4 1

1 5 10 10 5 1

1 6 15 20 15 6 1

Every row starts and ends with a 1.
To find each entry in a row you add the two numbers above it.

This is called
Pascal's
Triangle

Rows and
Diagonals

Diagonal 0
Diagonal 1
Diagonal 2
Diagonal 3

Row 0 → 1
Row 1 → 1 1
Row 2 → 1 2 1
Row 3 → 1 3 3 1
Row 4 → 1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1
1 7 21 35 35 21 7 1
1 8 28 56 70 56 28 8 1

The 2nd # in each row is the same as the row #.

Row 7
Diag 5

Row 6
Diag 4 = 15

Expand each:

1. $(x+1)^2$

$= x^2 + 2x + 1$

2. $(x+1)^3$

$(x^2+2x+1)(x+1)$

$= x^3 + 3x^2 + 3x + 1$

3. $(x+1)^4$

$(x^3+3x^2+3x+1)(x+1)$

$= x^4 + 4x^3 + 6x^2 + 4x + 1$

Do you notice any relationship between Pascal's Triangle and the expansions just completed?

1
1 1
1 2 1 → $(x+1)^2 = x^2 + 2x + 1$
1 3 3 1 → $(x+1)^3 = x^3 + 3x^2 + 3x + 1$
1 4 6 4 1 → $(x+1)^4 = x^4 + 4x^3 + 6x^2 + 4x + 1$
1 5 10 10 5 1
1 6 15 20 15 6 1
1 7 21 35 35 21 7 1
1 8 28 56 70 56 28 8 1

In general: $(a + b)^n$

n = Row # in Pascals Triangle

$(a + b)^n = \_a^n + \_a^{n-1}b^1 + \_a^{n-2}b^2 + \ldots\ldots \_a^1b^{n-1} + \_b^n$

These coefficients are the numbers in Row n of Pascal's Triangle

Expand using Pascal's Triangle.

$(c + 2)^5$

Go to Row 5 of Pascal's Triangle which has six #'s leading to six terms in the expanded form of this. The six #'s in Row 5 are the coefficients of the six terms (1 5 10 10 5 1)

$1c^5 + 5c^4 \cdot 2 + 10c^3 \cdot 2^2 + 10c^2 \cdot 2^3 + 5c \cdot 2^4 + 1 \cdot 2^5$

$$\boxed{c^5 + 10c^4 + 40c^3 + 80c^2 + 80c + 32}$$