Homework #2

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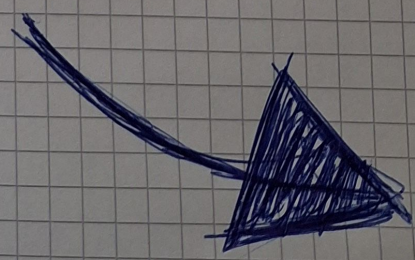
Problem 2.1: Perform the polynomial division.

a)

$$
\begin{array}{r|l}
x^4 - 5x^3 + 17x^2 + 25x - 28 & x - 7 \\
-(x^4 - 7x^3) & \hline
2x^3 - 17x^2 + 25x & x^3 + 2x^2 + 3x + 4 \\
-(2x^3 - 14x^2) & \\
\hline
-3x^2 + 25x & \\
-(-3x^2 + 21x) & \\
\hline
4x - 28 & \\
-(4x - 28) & \\
\hline
0 &
\end{array}
$$

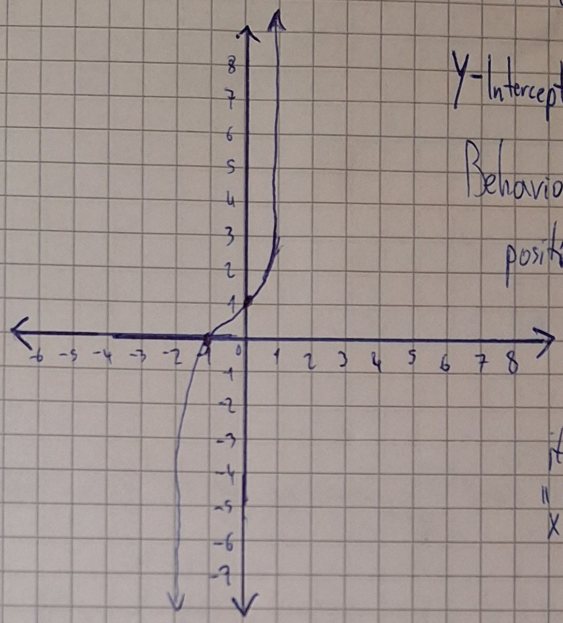
b)

$$
\begin{array}{r|l}
2x^5 - 6x^4 - 4x^3 + 27x^2 - 33x + 9 & x^2 - 3x + 1 \\
-(2x^5 - 6x^4 + 2x^3) & \hline
-6x^3 + 27x^2 - 33x & 2x^3 - 6x + 9 \\
-(-6x^3 + 18x^2 - 6x) & \\
\hline
9x^2 - 27x + 9 & \\
-(9x^2 - 27x + 9) & \\
\hline
0 &
\end{array}
$$



Problem 2.2

a) $x^3 + x^2 + x + 1 = 0$



Roots: It only has 1 root which can be found at $(-1, 0)$. $\boxed{x = -1}$

Y-Intercept: $(0, 1)$

Behaviour at Infinity: Since the coefficient is positive before the "x^3" the polynomial goes towards positive infinity as "x" goes towards positive infinity and it goes towards negative infinity if "x" goes towards negative infinity.

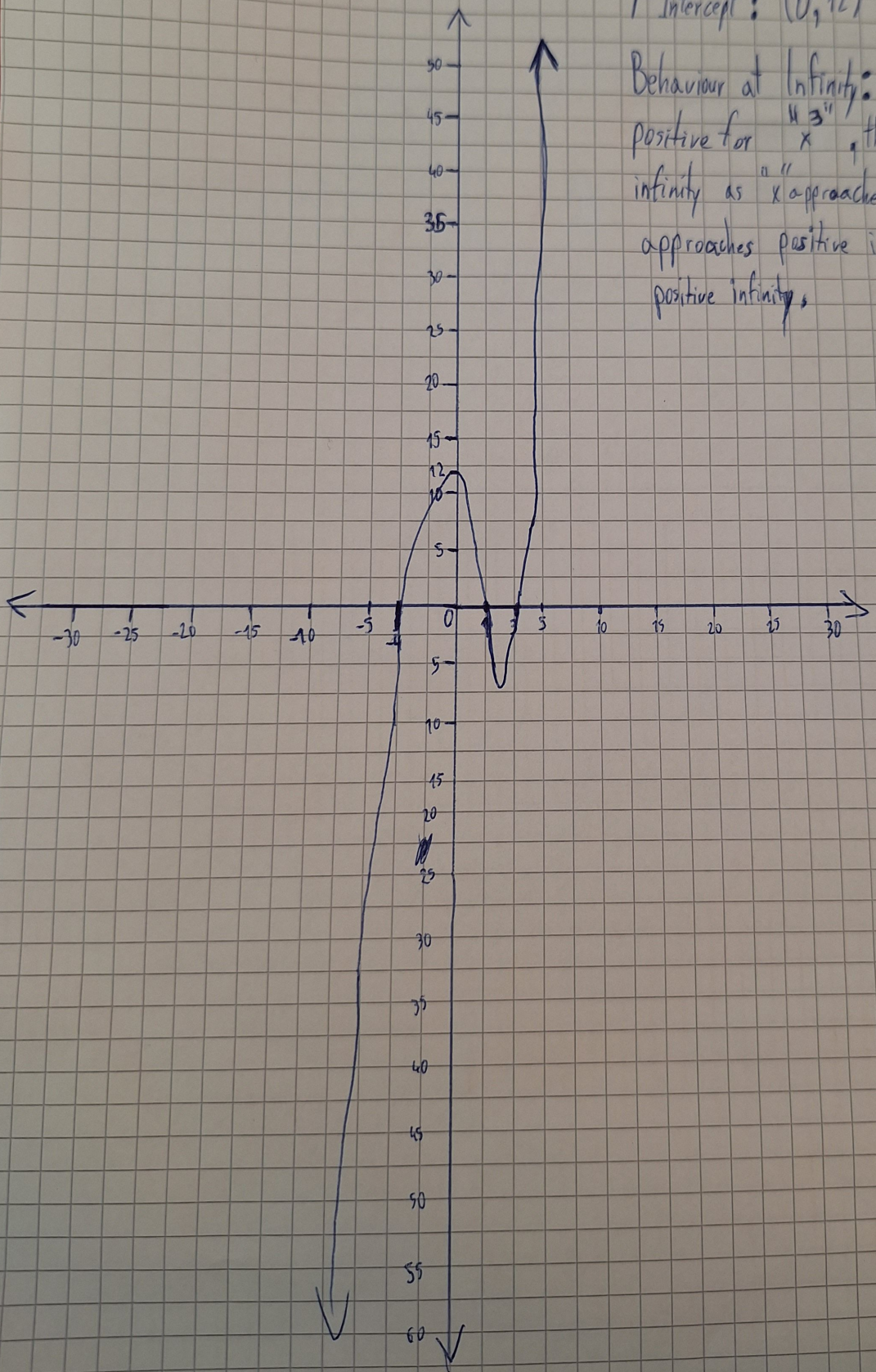
Problem 2.2:

b) $x^3 - 13x + 12$

Roots: $x = +3$; $x = 1$; $x = -4$

Y-Intercept: $(0, 12)$

Behaviour at Infinity: Since the coefficient is positive for "3" x, the polynomial goes to negative infinity as "x" approaches negative infinity and it approaches positive infinity as "x" approaches positive infinity.



Problem 2.3: Find all the roots of the equations:

a) What is the value of $\binom{6}{4}$?

$$\binom{6}{4} = \frac{6!}{4! \cdot (6-4)!} = \frac{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{4 \cdot 3 \cdot 2 \cdot 1 \cdot (2)!} = \frac{6 \cdot 5}{2 \cdot 1} = \frac{30}{2} = \boxed{15}$$

b) What is the coefficient of x^6 in the expansion of $(1+x)^{10}$?

Pascals triangle in row 10: x^{10} x^9 x^8 x^7 $\boxed{x^6}$ x^5 x^4 x^3 x^2 x^1 x^0

1 10 45 120 **210** 252 210 120 45 10 1

The coefficient of x^6 in the expansion of $(1+x)^{10}$ is 210.

Expression at " $x^{6\,4}$ " is $= 210 \cdot 1^4 \cdot x^6 = 210x^6$

Full expression: $x^{10} + 10x^9 + 45x^8 + 120x^7 + \underline{\underline{210x^6}} + 252x^5 + 210x^4 + 120x^3 + 45x^2 + 10x + 1$

THE END