

R6. Synthetic Division

p. 1

Divide any polynomial by $x \pm c$
Long division, with simpler notation

Ex: Divide $3x^3 + 6x^2 + 11x + 2$ by $x - 2$

$2 \overline{) 3 \quad 6 \quad 11 \quad 2}$ ← Coefficients of polynomial

c , where divisor is $x - c$ (sign change)

$2 \overline{) 3 \quad 6 \quad 11 \quad 2}$

↓

3

$2 \overline{) 3 \quad 6 \quad 11 \quad 2}$

↓ ↗ 6 ↗ 24 ↗ 70

3 12 35 72

Multiply by c
and add columns

quotient = $3x^2 + 12x + 35$

remainder = 72

p. 2

$$3x^3 + 6x^2 + 11x + 2 = (x-2)(3x^2 + 12x + 35) + 72 \checkmark$$

$5x^4 + 7x^2 + 10x + 3$ is divided by $x+3$

-3

5	0	7	1	3
↓	-15	45	-156	438
5	-15	52	-146	441

441

remainder = 441

Ex: Is $x+2$ a factor of $-4x^3+5x^2+8$? p. 3

Polynomial = Divisor $\cdot$ Quotient + Remainder

Yes if Remainder = 0

No if Remainder $\neq$ 0

$$\begin{array}{r} -2 \overline{) -4 \ 5 \ 0 \ 8} \end{array}$$

$$\begin{array}{r} -2 \overline{) -4 \ 5 \ 0 \ 8} \\ \underline{8 \ -26 \ 52} \\ -4 \ 13 \ -26 \ 60 \end{array}$$

quotient = $-4x^2 + 13x - 26$

remainder = 60

No. Remainder $\neq$ 0