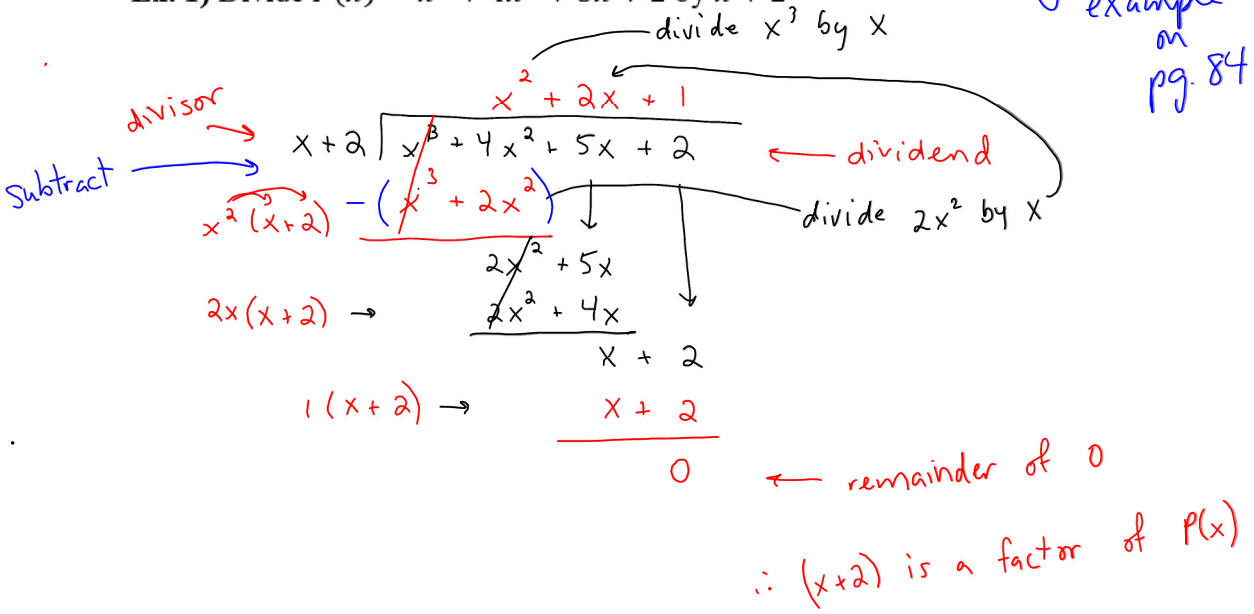
Lesson 1 Long Division

Note: When dividing a polynomial by a binomial, the terms are written in descending order. Use 0 as a placeholder if a degree is missing.

Ex. 1) Divide $P(x) = x^3 + 4x^2 + 5x + 2$ by $x + 2$

good example on pg. 84



Resulting functions should be expressed as

$$\frac{P(x)}{x-a} = Q(x) + \frac{R}{x-a}$$

$$\frac{x^3+4x^2+5x+2}{x+2} = x^2+2x+1+\frac{0}{x+2}$$

← not necessary because R = 0

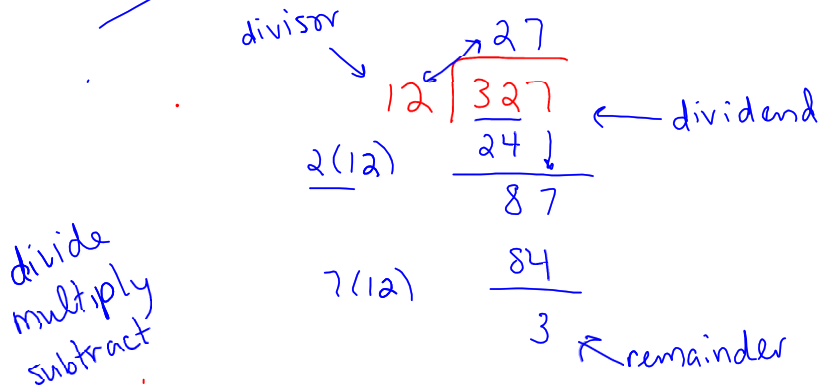
Or

$$P(x) = (x-a)\cdot Q(x) + R$$

Dividend = Divisor x Quotient + Remainder

$$x^3+4x^2+5x+2 = (x+2)(x^2+2x+1) + 0$$

Recall



$$\frac{327}{12} = 27 + \frac{3}{12}$$

$$327 = 12(27) + 3$$

$$\begin{array}{r} 186 \\ 23\overline{)4278} \\ 23 \\ \hline 197 \\ 184 \\ \hline 138 \\ 138 \\ \hline 0 \end{array}$$

$$
\begin{array}{r}
217 \\
19\overline{)4133} \\
38 \\
\hline
33 \\
19 \\
\hline
143 \\
133 \\
\hline
10
\end{array}
$$

$$\frac{4133}{19} = 217 + \frac{10}{19} \qquad \text{or} \qquad 4133 = 19(217) + 10$$

Ex. 2) Divide $2x^3 + 5 - 2x + 3x^2$ by $(x - 1)$

$2x^2 + 5x + 3$

$x-1 \overline{)\ 2x^3 + 3x^2 - 2x + 5}$ ← must be in descending order

$2x^2(x-1)$ $2x^3 - 2x^2$ ↓

$5x^2 - 2x$

$5x(x-1)$ $5x^2 - 5x$ ↓

$3x + 5$

$3(x-1)$ $3x - 3$

8

$3(-1)-2$

$3+2$

$-2(-1)-5$

$-2+5$

$$\frac{2x^3+3x^2-2x+5}{x-1} = 2x^2+5x+3+\frac{8}{x-1}$$ or $2x^3+3x^2-2x+5 = (x-1)(2x^2+5x+3)+8$

Ex. 3) Divide $3x^4 - x^3 + 3x - 20$ by $x + 2$

$3x^3 - 7x^2 + 14x - 25$

$x+2 \overline{)\ 3x^4 - x^3 + 0x^2 + 3x - 20}$

$3x^4 + 6x^3$ ↓ placeholder

$-7x^3 + 0x^2$

$-7x^3 - 14x^2$

$14x^2 + 3x$

$14x^2 + 28x$

$-25x - 20$

$-25x - 50$

30

$$\frac{3x^4-x^3+3x-20}{x+2} = 3x^3-7x^2+14x-25+\frac{30}{x+2}$$

Assign pg. 89 #1 a,d