## fully factor

$y = x^3 + x^2 - 14x - 24$ if $x = -2$ is a root $\nearrow (x+2)$

$$
\begin{array}{r|l}
 & x^2 - x - 12 \\
\hline
x+2 & x^3 + x^2 - 14x - 24 \\
 & -\ x^3 + 2x^2 \quad \downarrow \quad \downarrow \\
\hline
 & -x^2 - 14x - 24 \\
 & -\ -x^2 - 2x \quad \downarrow \\
\hline
 & -12x - 24 \\
 & -\ -12x - 24 \\
\hline
 & \emptyset
\end{array}
$$

$\xrightarrow{\text{factor}}$ $x^2 \overset{A}{-} x \overset{M}{-} 12$

$(x-4)(x+3)$

$$\boxed{y = (x-4)(x+3)(x+2)}$$

## long division

① is it a factor? yes|no

→ do LD & see if there's a remainder

② divide $\underbrace{3x^2 + 5x - 2}_{\text{top}} + \dfrac{7}{x+1}$ ← remain ← outside

③ fully factor $y = (\quad)(\quad)(\quad)\ldots$

→ long division

→ factor the top

# graphing polynomials

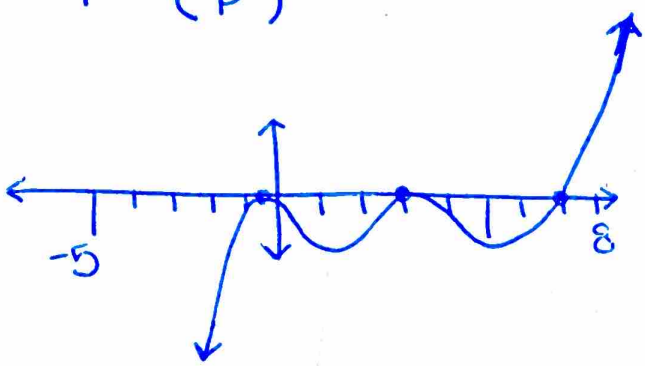
$\boxed{\text{ex1}}$ $y = 4(x-3)^2(2x+1)^2(x-7)^1$

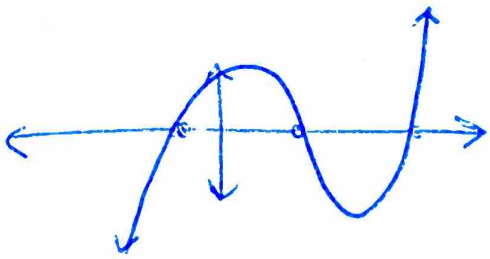
LC: $4 \cdot 1^2 \cdot 2^2 \cdot 1 = 16$ (+)
D: $2+2+1 = 5$ (odd)
EB: down - up
$x = 3$ (B)
$x = -1/2$ (B)
$x = 7$ (P)

$x-3=0$
$x=3$

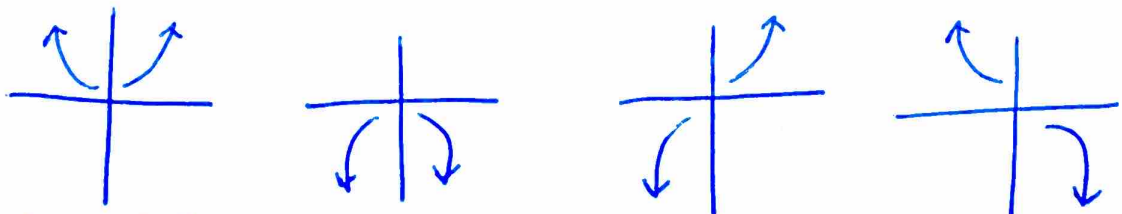
$2x+1=0$
$x=-1/2$

$x-7=0$
$x=7$



## end behaviors



D even
LC +

D even
LC −

D odd
LC +

D odd
LC −

$(x^2-x-12)$

$(x+3)(x-4)(x+2) = x^3 - x^2 - 12x + 2x^2 - 2x - 24$