

Do Now:

Math #4:  $\sqrt[3]{\quad}$

Factor Completely:

$$\textcircled{1} \sqrt[3]{x^3} - \sqrt[3]{125} = \boxed{(x-5)(x^2+5x+25)}$$

$\begin{matrix} a^3 & b^3 & a & b & a^2 & ab & b^2 \\ & & 5 & & 0 & & \text{AP} \end{matrix}$

1  
8  
27  
64  
125

$$\textcircled{2} 16x^5 + 54x^2$$

GCF  $2x^2 (\sqrt[3]{8x^3} + \sqrt[3]{27}) (2x)^2 3^2$

$$\boxed{2x^2 (2x+3)(4x^2-6x+9)}$$

$\begin{matrix} a & b & a^2 & ab & b^2 \\ & 5 & 0 & & \text{AP} \end{matrix}$

# Solving Polynomial Equations

①  $2x^{\textcircled{3}} - 12x^2 + 18x = 0$

$\Leftrightarrow 2x(x^2 - 6x + 9) = 0$

$2x^1 | (x-3) | (x-3) = 0$

or  $\underline{=} 2x(x-3)^{\textcircled{2}}$  *even exponent*

$2x=0$	$x-3=0$	$x-3=0$
$\frac{1}{2}$	$x=3$	$x=3$

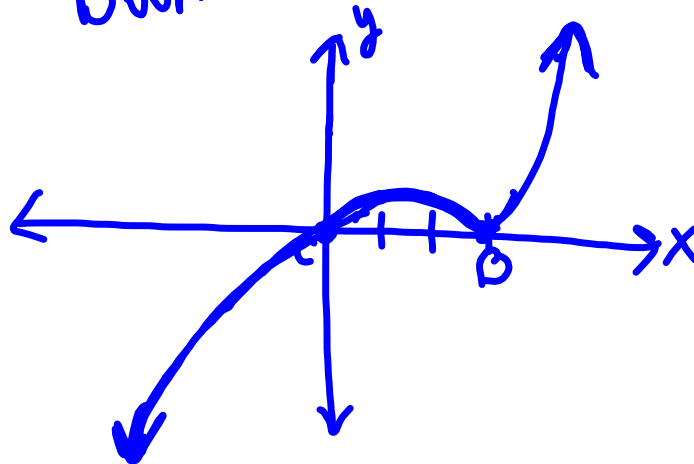
$x=0$   
cut

repeated root  
bounce

deg: 3/odd

LC: 2/pos.

EB: ↓ ↑



②  $-2x^4 + 16x^2 - 32 = 0$

GCF  $-2(x^4 - 8x^2 + 16) = 0$  → factor as if it was a quadratic  
A M

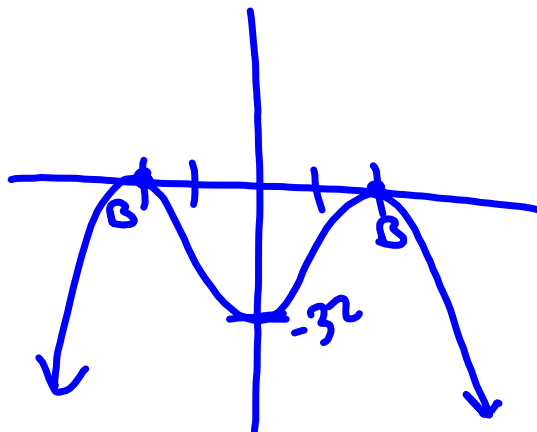
$-2(x^2 - 4)(x^2 - 4) = 0$  → DOTS

$-2(x-2)(x+2)(x-2)(x+2) = 0$  → bounce pts.

OR  $-2(x-2)^2(x+2)^2 = 0$   
 ~~$-2 = 0$~~  |  $x = 2$  |  $x = -2$   
 reject

deg: 4 / even  
 LC: -2 / Neg.

EB: ↓↓



$$\textcircled{3} \quad x^3 - 8x^2 - 4x + 32 = 0$$

Grouping

$$\textcircled{x^2}(\textcircled{x-8}) - \textcircled{4}(\textcircled{x-8}) = 0$$

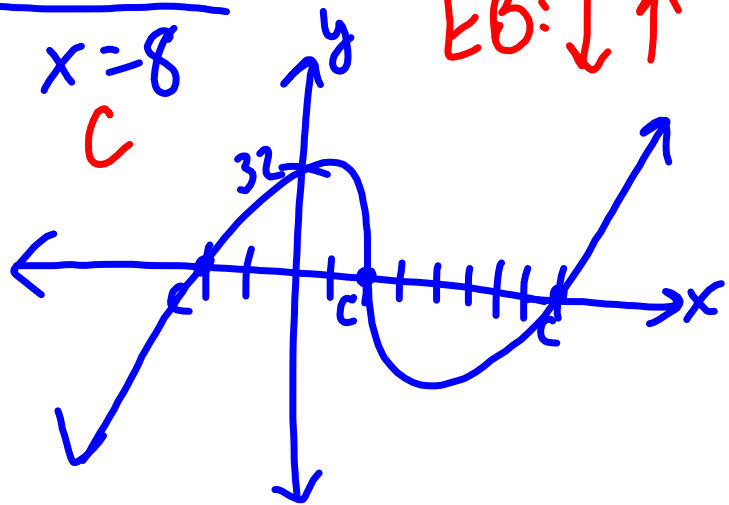
DOTS

$$(x^2 - 4)(x - 8) = 0$$

$$(x+2)'(x-2)'(x-8)' = 0$$

$x = -2$	$x = 2$	$x = 8$
$C$	$C$	$C$

deg: 3/odd  
 LC: 1/⊕  
 EB: ↓ ↑



④  $x^4 + 3x^3 - x - 3 = 0$  Grouping

$(x^3)(x+3) - 1(x+3) = 0$

diff. of cubic SOAP  $(x^3 - 1)(x+3) = 0$

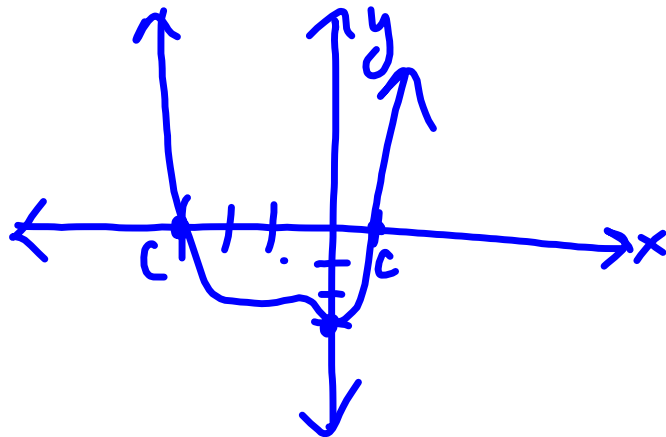
$(x-1)$ $x-1=0$ $x=1$ C	$(x^2+x+1)$ $x^2+x+1=0$ $x = \frac{-1 \pm \sqrt{1^2 - (4 \cdot 1 \cdot 1)}}{2(1)}$	$(x+3)$ $x+3=0$ $x=-3$ C
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$x = \frac{-1 \pm \sqrt{-3}}{2}$

$x = \frac{-1 \pm i\sqrt{3}}{2}$

→ won't touch x-axis at all

deg: 4/even  
LC: 1/⊕  
EB: ↑↑



$$\textcircled{5} \quad x^3 - 8x^2 + 11x + 20 = 0$$

$$x^2(x-8) + (11x+20) = 0$$

can't be grouped

"Cheat" w/ Calc:

$\frac{\text{root}}{x=4}$  + synthetic division

$$\begin{array}{r|rrrr} 4 & 1 & -8 & 11 & 20 \\ & & 4 & -16 & -20 \\ \hline & 1 & -4 & -5 & 0 \end{array}$$

$$x^2 - 4x - 5 = 0$$

$$(x-5)(x+1) = 0$$

$$\begin{array}{c|c} x=5 & x=-1 \end{array}$$

$$x = -1, 4, 5$$