

Warm up

Sum of Cubes

$$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

$$x^6 + 27$$

$$(x^2 + 3)(x^4 - 3x^2 + 9)$$

Difference of Cubes

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

$$8x^3 - 64y^3$$

$$8(x^3 - 8y^3)$$

$$8(x - 2y)(x^2 + 2xy + 4y^2)$$

Questions From Homework

$$\textcircled{a} \text{ d) } (x^5 - 5x^4)(10x^3 + 50x^2)(9x - 45)$$

$$x^4(x-5) - 10x^2(x-5) + 9(x-5)$$

$$(x-5)(x^4 - 10x^2 + 9) \leftarrow \begin{array}{l} \text{simple trinomial} \\ -1x^2 - 9 = 9 \\ -1 + 9 = -10 \end{array}$$

$$(x-5)(x^2 - 9)(x^2 - 1) \leftarrow \text{diff. of squares}$$

$$(x-5)(x-3)(x+3)(x-1)(x+1)$$

Factor Theorem

Factor Theorem

$(x-b)$ is a factor of $f(x)$ **if and only if** $f(b) = 0$.

Hint: Find a value of "x" that will make it = 0

$$\begin{array}{l}
 x^3 + 5x^2 - 2x - 24 \qquad x = 2 \\
 (2)^3 + 5(2)^2 - 2(2) - 24 \qquad (x-2) = 0 \\
 8 + 20 - 4 - 24 \\
 0
 \end{array}$$

$(x - 2)$ is a factor

Use long division to find another factor:

$$\begin{array}{r|l}
 \begin{array}{r}
 \underline{x-2} \overline{) x^3 + 5x^2 - 2x - 24} \\
 \underline{-(x^3 - 2x^2)} \\
 7x^2 - 2x - 24 \\
 \underline{-(7x^2 - 14x)} \\
 12x - 24 \\
 \underline{-(12x - 24)} \\
 0
 \end{array} &
 \begin{array}{l}
 \text{trinomial} \\
 \downarrow \\
 (x-2)(x^2 + 7x + 12) \\
 (x-2)(x+4)(x+3)
 \end{array}
 \end{array}$$

Factor further (if possible):

Factor Theorem

Factor Theorem

$(x-b)$ is a factor of $f(x)$ **if and only if** $f(b) = 0$.

$$\begin{aligned}
 P(x) &= 2x^3 - 5x^2 - 4x + 3 \\
 2(-1)^3 - 5(-1)^2 - 4(-1) + 3 \\
 -2 - 5 + 4 + 3 \\
 0
 \end{aligned}$$

$$x = -1$$

$$\boxed{x+1=0}$$

$(x+1)$ is a factor

decomposition

$$\begin{array}{r}
 \underline{x+1} \overline{) 2x^3 - 5x^2 - 4x + 3} \\
 \underline{-(2x^3 + 2x^2)} \\
 -7x^2 - 4x + 3 \\
 \underline{-(-7x^2 - 7x)} \\
 3x + 3 \\
 \underline{-(3x + 3)} \\
 0
 \end{array}$$

$$(x+1)(2x^2 - 7x + 3)$$

$$(x+1)\left(x - \frac{1}{2}\right)\left(x - \frac{6}{2}\right)$$

$$\boxed{(x+1)(2x-1)(x-3)}$$

Homework

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b) $x^3 + 0x^2 - 7x + 6$

