Factoring Perfect Cubes and Higher Powers

Kickoff- Solve each of the following:

1) $m^2 - 9m = 0$

$m(m-9)=0$

$m=0$ $m-9=0$ $+9\ +9$ $m=9$

2) $3b^2 + 6 = 11$

$-6\ -6$

$\frac{3b^2}{3} = \frac{5}{3}$ $b = \pm\sqrt{\frac{5}{3}}$

3) $r^2 - 3 = 22$

$+3\ +3$

$\sqrt{r^2} = \sqrt{25}$

$r = \pm 5$

4) $3(x-4)^2 = 162$

$\frac{3}{3}$ $\frac{}{2}$

$\sqrt{(x-4)^2} = \sqrt{81}$

$x-4 = \pm 9$

$x-4=9$ $+4\ +4$ $x=13$

$x-4=-9$ $+4\ +4$ $x=-5$

Perfect Cube- a product of multiplying the same # 3 times

Perfect Cubes	Cube Root
$1\cdot1\cdot1 = 1$	$\sqrt[3]{1} = 1$
$2\cdot2\cdot2 = 8$	$\sqrt[3]{8} = 2$
$4\cdot4\cdot4 = 64$	$\sqrt[3]{64} = 4$
$6\cdot6\cdot6 = 216$	$\sqrt[3]{216} = 6$
$7\cdot7\cdot7 = 343$	$\sqrt[3]{343} = 7$
$x\cdot x\cdot x = x^3$	$\sqrt[3]{x^3} = x$
$x^2\cdot x^2\cdot x^2 = x^6$	$\sqrt[3]{x^6} = x^2$
$x^3\cdot x^3\cdot x^3 = x^9$	$\sqrt[3]{x^9} = x^3$

1) Multiply: $(a-b)(a^2+ab+b^2)$

$a^3 + a^2b + ab^2 - a^2b - ab^2 - b^3$

$a^3 - b^3$

Difference of perfect cubes.

2) Multiply: $(a+b)(a^2-ab+b^2)$

$a^3 - a^2b + ab^2 + ba^2 - ab^2 + b^3$

$a^3 + b^3$

Sum of perfect cubes.

Sum/Difference of Perfect Cubes:

SOAP

Same Opposite Always Positive

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

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

Ex1: $x^3 + 27$

$a = \sqrt[3]{x^3} = x$ $b = \sqrt[3]{27} = 3$ $ab = 3x$

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

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

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

Ex2: $64x^3 - 8y^3$

$a = \sqrt[3]{64x^3} = 4x$ $b = \sqrt[3]{8y^3} = 2y$

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

$(4x-2y)(16x^2+8xy+4y^2)$

Ex3: $250 + 2x^3$

$2(125+x^3)$

$a = \sqrt[3]{125} = 5$ $b = \sqrt[3]{x^3} = x$

$2(5+x)(5^2-5x+x^2)$

$2(5+x)(25-5x+x^2)$

Ex4: $8x^4 - x$

Higher Powers

* DOTS twice - master product.

Ex1: $x^8 - 2x^4 + 1$

$x^8 - x^4 - x^4 + 1$

$x^4(x^4-1) - 1(x^4-1)$

$(x^4-1)(x^4-1)$

$(x^4-1)(x^2+1)(x^2-1)(x^2+1)$

Ex2: $x^4 - 7x^2 + 12$

Ex3: $x^4 + 7x^2 + 6$

Ex4: $-2r^8 + 5r^4 - 2$

$-1(2r^8 - 5r^4 + 2)$

$4r^8$

$-1(2r^8 - 4r^4 - r^4 + 2)$

$-1(2r^4(r^4-2) - 1(r^4-2))$

$-1(2r^4-1)(r^4-2)$

Practice:

1) $x^4 + 8x^2 - 2$

2) $x^3 - 64$

3) $-27d^3 + 125$

4) $-25p^4 + 160p^2 + 320$

5) $10a^3 + 17a^2 + 6a$

6) $-9n^{10} + 58n^5 - 24$

11) $x^5 + x^4 - 7x^3 - 7x^2 + 12x + 12$

12) $x^3 - 10x^2y + 24y^2x$

7) $8a^3 + 125$

8) $x^3 - 216y^3$

13) $a^3 + 343b^3$

14) $-a^3 - 8$

9) $2x^4 - 6x^2y^2 - 108y^4$

10) $-16x^4 + 58x^2 + 24$

15) $250x^4 + 128x$

16) $-2r^8 + 5r^4 - 2$