Solve each polynomial equation by factoring. Find all real and/or imaginary/complex roots. Simplify answers.

(1) $x^3 - 216 = 0$

$\sqrt[3]{x^3} = 3 \qquad \sqrt[3]{216} = 6$

1st root/ solution

$(x-6)(x^2+6x+6^2)$

$(x-6)\ (x^2+6x+36)$

$a = 1; b = 6; c = 36$

$$x = \frac{-(b) \pm \sqrt{(b^2) - 4(a)(c)}}{2(a)}$$

$$x = \frac{-(6) \pm \sqrt{(6^2) - 4(1)(36)}}{2(1)}$$

$$x = \frac{-6 \pm \sqrt{-144}}{2}$$

$$x = \frac{-(6) \pm \sqrt{(6^2) - 4(1)(36)}}{2(1)}$$

$$x = \frac{-6 \pm \sqrt{-108}}{2}$$

$$x = \frac{-6 \pm 6i\sqrt{3}}{2}$$

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

$x = 3 \pm 3i\sqrt{3} \qquad x = 6$

(2) $8x^3 + 125$

$\sqrt[3]{8x^3} = 2x \qquad \sqrt[3]{125} = 5$

1st root/ solution

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

$(2x+5)\ (4x^2-10x+25)$

$a = 4; b = -10; c = 25$

$$x = \frac{-(b) \pm \sqrt{(b^2) - 4(a)(c)}}{2(a)}$$

$$x = \frac{-(-10) \pm \sqrt{(-10^2) - 4(4)(25)}}{2(4)}$$

$$x = \frac{10 \pm \sqrt{-300}}{8}$$

$$x = \frac{10 \pm 10i\sqrt{3}}{8}$$

$$x = \frac{2(5 \pm 5i\sqrt{3})}{8}$$

$x = \frac{5 \pm 5i\sqrt{3})}{4} \qquad x = -\frac{-5}{2}$