33.) $\frac{(-1-6i)}{5+9i}\frac{(5-9i)}{(5-9i)} = \frac{-5+9i-30i+54i^2}{25-81i^2}$

$= \frac{-5-21i-54}{25+81} = \frac{-59-21i}{106}$

$= -\frac{59}{106} - \frac{21}{106}i$

31) $\frac{4+9i}{12i} \cdot \frac{i}{i}$

$$\frac{4i+9i^2}{-12}$$

$$\frac{4i-9}{-12} = \frac{9}{12} - \frac{4}{12}i$$

$$\frac{3}{4} - \frac{1}{3}i$$

55) $\dfrac{10+i}{-1+5i} \dfrac{(-1-5i)}{(-1-5i)}$

5.) $4i\left(\frac{i}{2}\right)^2\left(-2i\right)^3$

$\cancel{4}i\left(\frac{i^2}{\cancel{4}}\right)\left(-8i^3\right)$

$-8i^6$

$-8(-1)$

6.) $(1+3i)^3$

$(A+B)^2$
$\neq A^2+B^2$

$\underbrace{(1+3i)(1+3i)}(1+3i)$

$(-8+6i)(1+3i)$

$-8-24i+6i-18$

$-26-18i$

1.5 Solving Quadratic Equations Using Square Roots
1.7 Solving Quadratic Equations Using CTS
1.8 Quadratic Formula

$x^2 = 9$

$x = \pm 3$

<u>Solving Quadratics By Taking Square Roots</u>

*Use solving by taking square roots when...

$x^2 - c = 0$

$x^2 = c$

$(x-c)^2 - k = 0$

$(x-c)^2 = k$

ex: Solve.

a) $3x^2 + 5 = 41$

$3x^2 = 36$

$\sqrt{x^2} = \sqrt{12}$

$x = \pm\sqrt{12}$

$x = \pm 2\sqrt{3}$

b) $4(x-2)^2+32=0$

$4(x-2)^2=-32$

$\sqrt{(x-2)^2}=\sqrt{-8}$

$x-2=\pm 2i\sqrt{2}$

$+2$

$x=2\pm 2i\sqrt{2}$

front!!!

$\sqrt{-8}=\sqrt{-1}\cdot\sqrt{8}$

$=i\sqrt{8}$

$=2i\sqrt{2}$

$x-2=0$

$+2$ $+2$

$\boxed{2\pm 2i\sqrt{2} \text{ or } 2+2i\sqrt{2},\ 2-2i\sqrt{2}}$

c) $3x^2 - 1 = 0$

$$\sqrt{x^2} = \sqrt{\frac{1}{3}}$$

$$x = \pm \frac{1}{\sqrt{3}} \frac{\sqrt{3}}{\sqrt{3}}$$

$$x = \pm \frac{\sqrt{3}}{3}$$

$$2(x-1)^2 + 1 = 33$$

$$\sqrt{(x-1)^2} = \sqrt{16}$$

$$x - 1 = \pm 4$$

$$x = 1 \pm 4$$

$$1+4 \quad 1-4$$

$$x = 5, -3$$

d) $5x^2 - 8 = -8$

$5x^2 = 0$

$x^2 = 0$

$x = 0$ ← mult. of 2

Solving Quadratics By CTS (completing the square)

*Use CTS to solve a quadratic equation when...

"b" is even

$ax^2+bx+c=0$

ex: Solve.

a) $x^2 - 4x - 10 = 0$

$x^2 - 4x \underline{+4} - 10 \underline{-4} = 0$ $\qquad \left(\frac{4}{2}\right)^2 = 4$

$(x-2)^2 - 14 = 0$

$\sqrt{(x-2)^2} = \sqrt{14}$

$x - 2 = \pm\sqrt{14}$

$x = 2 \pm \sqrt{14}$

b) $x^2 - 14x + 103 = 0$

$$x^2 - 14x \underline{+49} + 103 \underline{-49} = 0$$

$$(x-7)^2 + 54 = 0$$

$$\sqrt{(x-7)^2} = \sqrt{-54}$$

$$x - 7 = \pm 3i\sqrt{6}$$

$$x = 7 \pm 3i\sqrt{6}$$

c) $-2x^2+4x-17=0$

$$-2(x^2-2x\underline{+1})-17\underline{+2}=0$$

$$-2(x-1)^2-15=0$$

$$\sqrt{(x-1)^2}=\sqrt{-\frac{15}{2}\frac{\sqrt{2}}{\sqrt{2}}}$$

$$x-1=\pm i\frac{\sqrt{30}}{2}$$

$$x=1\pm\frac{i\sqrt{30}}{2}$$

d) $4x^2 + 12x + 1 = 0$

$$4\left(x^2 + 3x \underline{+ \tfrac{9}{4}}\right) + 1 - 9 = 0$$

$$4\left(x + \frac{3}{2}\right)^2 = 8$$

$$\sqrt{\left(x + \frac{3}{2}\right)^2} = \sqrt{2}$$

$$x + \frac{3}{2} = \pm\sqrt{2}$$

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

Solving Quadratics Using the Quadratic Formula

Let $a, b, c \in R$ such that $a \neq 0$. The solutions of the quadratic equation $ax^2 + bx + c = 0$ are:

$$\boxed{\text{Quadratic Formula: } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}}$$

*Use the Quadratic Formula to solve a quadratic equation when... the other methods aren't working / friendly.

ex: Solve.

a) $x^2 + 3x = 2$

$$x^2 + 3x - 2 = 0$$

$a = 1$
$b = 3$
$c = -2$

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

$$x = \frac{-3 \pm \sqrt{17}}{2} = \frac{-3}{2} \pm \frac{\sqrt{17}}{2}$$

$$\frac{6 \pm 4\sqrt{3}}{3} = \frac{12 \pm 8\sqrt{3}}{6}$$

$$\frac{12}{6} + \frac{8\sqrt{3}}{6}$$

$$2 \pm \frac{4\sqrt{3}}{3}$$

b) $-x^2 + 4x - 5 = 0$

$-(x^2 - 4x + 5) = 0$

$a = 1$
$b = -4$
$c = 5$

$$x = \frac{4 \pm \sqrt{16 - 4(1)(5)}}{2}$$

$$x = \frac{4 \pm \sqrt{-4}}{2} = \frac{4 \pm 2i}{2}$$

$$\frac{4}{2} \pm \frac{2i}{2} = 2 \pm i$$

ex: Determine which method is best to solve each quadratic equation. Do not repeat a method. DO NOT SOLVE.

a)

1. $x^2 + 6x - 3 = 0$
2. $x^2 + 6x + 5 = 0$
3. $2(x+1)^2 - 4 = 0$
4. $x^2 + 2x + 5 = 0$

Factoring

Sq. root

CTS

Quad Form

b)

Factor 1. $14x^2 - 21x = 0$

$7x(2x-3) = 0$

$x = 0, \frac{3}{2}$

Quad form. 2. $x^2 + 3x - 1 = 0$

$x = \frac{-3 \pm \sqrt{13}}{2} = \frac{-3}{2} \pm \frac{\sqrt{13}}{2}$

CTS 3. $2x^2 - 8x + 5 = 0$

$2(x^2 - 4x \underline{+4}) \underline{-8} + 5 = 0$

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

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

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

or

$\frac{4 \pm \sqrt{6}}{2}$

Square root 4. $x^2 - 80 = 0$

$x^2 = 80$

$x = \pm\sqrt{80}$

$x = \pm 4\sqrt{5}$