Homework --

Sentences! "context"

Questions?

$ax^2+bx+c=0$

$x^2+\frac{b}{a}x = -\frac{c}{a}$

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

$-\frac{c}{a}\cdot\frac{4a}{4a}+\frac{b^2}{4a^2}$

$=\frac{b^2-4ac}{4a^2}$

$\frac{\frac{b}{a}}{2} = \frac{b}{a}\cdot\frac{1}{2} = \frac{b}{2a}$

$(x+\frac{b}{2a})^2 = \frac{b^2-4ac}{4a^2}$

$\sqrt{\quad} = \sqrt{\quad}$

$|x+\frac{b}{2a}| = \sqrt{\frac{b^2-4ac}{4a^2}} = \frac{\sqrt{b^2-4ac}}{\sqrt{4a^2}} = \frac{\sqrt{b^2-4ac}}{2|a|}$

$x+\frac{b}{2a} = \pm\frac{\sqrt{b^2-4ac}}{2a}$

$x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$-3x^2+5x-3=0$

$3x^2-5x+3=0$

Derivation of Quadratic Formula in response to an innocent question.

Today: Some S'1.6 examples

Some S'1.5 probs on the board.

Last time $A = B \Rightarrow A^2 = B^2, A^3 = B^3, \ldots$

But $A^2 = B^2 \not\Rightarrow A = B$

$A^2 = B^2 \Rightarrow A = \pm B$

Squaring both sides can inject extraneous solutions

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

$\left(x^{\frac{2}{3}}\right)^3 = 1^3$

$x^2 = 1$

$x = \pm 1$

$(x^2)^b = x^{2b}$

Check

S1.6 #s 1, 6, 9, 12, 18, 19, 21, 22, 23, 27, 28
31, 34, 35, 36, 37, 41, 43, 47, 53, 55, 59, 63,
65, 67, 69, 73

Equations with rational (fractional) exponents.
.. Quadratic in form I & II
.. with absolute value
.. .. $\sqrt{}$ & stuff.

(36) $x^4 + 10 = 7x^2$ Quadratic in Form

Let $u = x^2$. Then

$u^2 + 10 = 7u$

$u^2 - 7u + 10 = 0$

$(u-5)(u-2) = 0$

$u-5=0$ or $u-2=0$

$u=5$ $u=2$

$x^2=5$ $x^2=2$

$x = \pm\sqrt{5}$ $x = \pm\sqrt{2}$

$x \in \{\pm\sqrt{5}, \pm\sqrt{2}\}$

Factor Theorem!

$x^2 - 7x + 10 = 0$

$x^2 - 7x = -10$

$x^2 - 7x + \left(\frac{7}{2}\right)^2 = -10 + \frac{49}{4}$

$\frac{7}{2} \rightsquigarrow \left(\frac{7}{2}\right)^2$

$\left(x - \frac{7}{2}\right)^2 = \frac{-40+49}{4} = \frac{9}{4}$

$=$

$x - \frac{7}{2} = \pm\sqrt{\frac{9}{4}} = \pm\frac{\sqrt{9}}{\sqrt{4}}$

$x = \frac{7}{2} \pm \frac{3}{2}$ $\frac{10}{2} = 5$, $\frac{4}{2} = 2$

$a^2 - b^2 = (a-b)(a+b)$ Difference of 2 squares

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

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

Difference of cubes

$(5i)^2 = 5^2 i^2 = -25$

(40) $x^4 - 625 = 0$

$(x^2-25)(x^2+25) = 0$

$= x^2 - (-25)$

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

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

$x \in \{\pm 5, \pm 5i\}$

#68 You should check all answers, but $\frac{9 \pm \sqrt{99}}{8}$!?

You really want me to plug that into $\frac{1}{x} - \sqrt{9x^2+1} = 0$?!

$u = x^2$

$u^2 - 625 = 0$

$(u-25)(u+25) = 0$

$u = 25$ $u = -25$

$x^2 = 25$ $x^2 = -25$

$x = \pm 5$ $x = \pm\sqrt{-25} = \pm i\sqrt{25} = \pm i5 = \pm 5i$

Same deal.
Your option on style.

http://dlippman.imathas.com/graphcalc/graphcalc.html

To check ugly ones, in S1.6, this is a good resource.

Has graphing capabilities:

Everything a TI-83 or 84 max/min, intersection, zeros.

Pocket CAS

CalcPro for iphone/iPad

$\left(\frac{x-5}{6}\right)^2 - \left(\frac{x-5}{6}\right) - 6 = 0$

$u = \frac{x-5}{6}$

$u^2 - u - 6 = 0$

$(u-3)(u+2) = 0$

$u = 3$ $\quad$ $u = -2$ $\quad$ & check.

$\frac{x-5}{6} = 3$ $\quad$ $\frac{x-5}{6} = -2$

$x - 5 = 18$ $\quad$ $x - 5 = -12$

$x = 23$ $\quad$ $x = -7$

(42)
(46) $(x^2+2x)^2 - 2(x^2+2x) - 3 = 0$

$u = x^2+2x$

$u^2 - 2u - 3 = 0$

$(u-3)(u+1) = 0$

$u = 3$ $\quad$ $u = -1$

$x^2+2x = 3$ $\quad$ $x^2+2x = -1$

$x^2+2x-3 = 0$ $\quad$ $x^2+2x+1 = 0$

$(x+3)(x-1) = 0$ $\quad$ $(x+1)^2 = 0$

$x+1 = \pm 0 = 0$

$x = 1, -3$ $\quad$ $x = -1$

$x \in \{-3, -1, 1\}$

(48) $2x+3\sqrt{x}-20=0$ Also quadratic in form.

$u=\sqrt{x}$!

$(\sqrt{x})^2 = x$ $\sqrt{x^2} = |x|$

$2u^2+3u-20=0$

$2u^2+8u-5u-20=0$

$2u(u+4)-5(u+4)=0$

$2u$ ☺ -5 ☺ $=0$

☺ $(2u-5)=0$

$(u+4)(2u-5)=0$

$u=-4$ OR $u=\frac{5}{2}$

$\sqrt{x}=-4$ OR $\sqrt{x}=\frac{5}{2}$

Nuvah!

$x=\frac{25}{4}$

(52) $x^{\frac{1}{2}} - 3x^{\frac{1}{4}} + 2 = 0$

$u = x^{\frac{1}{2}}$

$u^2 = x$

$u = x^{\frac{1}{4}}$

$u^2 = \left(x^{\frac{1}{4}}\right)^2 = x^{\frac{1}{2}}$

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

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

$3u^2 - u - 2 = 0$

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

$3u(u-1) + 2(u-1) = 0$

$(u-1)(3u+2)$

$u = 1 \qquad u = -\frac{2}{3}$

$x^{\frac{1}{4}} = 1 \qquad x^{\frac{1}{4}} = -2/3$

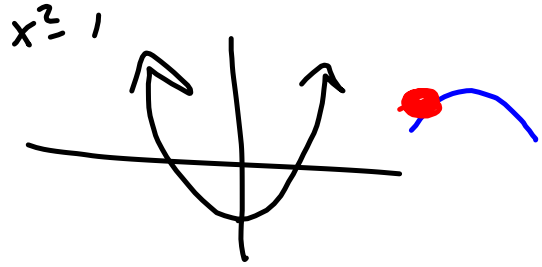
$x = 1^4 = 1$

$x = 1$

54 $|x^2-1| = 1$

$x^2-1=1$ or $x^2-1=-1$

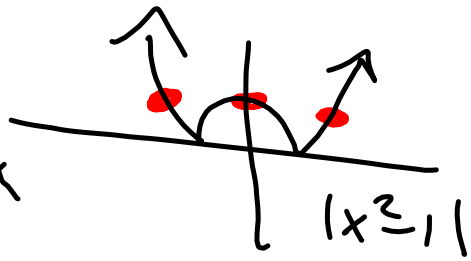
etc.



60 $|3x-4| = |x|$

$3x-4 = x$ or $3x-4=-x$

etc.



(66) The toughest.

$$\sqrt{16x+1} - \sqrt{6x+13} = 1$$

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

$$\sqrt{16x+1} = \sqrt{6x+13} + 1$$

$$16x+1 = 6x+13 + \left(2\sqrt{6x+13}\right)(1) + 1^2$$

$$= 6x+13+2\sqrt{6x+13}+1$$

$$= 6x+14+2\sqrt{6x+13} = 16x+1$$

Square both sides!

$$2\sqrt{6x+13} = 10x-15$$

$$4(6x+13) = 100x^2-260x+169$$

$$24x+52 = 100x^2-260x+169$$

$$100x^2-284x+113 = 0$$

etc.