Math 146 Extra practice, like test problems #7 and # 13/17.
Solve and leave the answer in exact simplified form (square roots, fractions, but no decimals)

1. $2x^2+4x+5=0$

$$x=\frac{-4\pm\sqrt{4^2-4\cdot 2\cdot 5}}{2\cdot 2}=\frac{-4\pm\sqrt{16-40}}{4}=\frac{-4\pm\sqrt{-24}}{4}=\frac{-4\pm i\sqrt{4}\sqrt{6}}{4}$$

$$=\frac{-4\pm 2i\sqrt{6}}{4}=\frac{\cancel{2}(-2\pm i\sqrt{6})}{\cancel{4}2}=\frac{-2\pm i\sqrt{6})}{2}$$

Or (also correct)

$$x=\frac{-4\pm\sqrt{4^2-4\cdot 2\cdot 5}}{2\cdot 2}=\frac{-4}{4}\pm\frac{\sqrt{-24}}{4}=-1\pm\frac{i\sqrt{4}\sqrt{6}}{4}=-1\pm\frac{\cancel{2}i\sqrt{6}}{\cancel{4}2}=-1\pm\frac{i\sqrt{6}}{2}$$

2. $2x^2-6x+3=0$

$$x=\frac{-(-6)\pm\sqrt{(-6)^2-4\cdot 2\cdot 3}}{2\cdot 2}=\frac{6\pm\sqrt{36-24}}{4}=\frac{6\pm\sqrt{12}}{4}=\frac{6\pm\sqrt{4}\sqrt{3}}{4}=\frac{6\pm 2\sqrt{3}}{4}=\frac{\cancel{2}(3\pm\sqrt{3})}{\cancel{4}2}=\frac{3\pm\sqrt{3}}{2}$$

Or (also correct)

$$x=\frac{-(-6)\pm\sqrt{(-6)^2-4\cdot 2\cdot 3}}{2\cdot 2}=\frac{6}{4}\pm\frac{\sqrt{36-24}}{4}=\frac{\cancel{6}3}{\cancel{4}2}\pm\frac{\sqrt{12}}{4}=\frac{3}{2}\pm\frac{\sqrt{4}\sqrt{3}}{4}=\frac{3}{2}\pm\frac{\cancel{2}\sqrt{3}}{\cancel{4}2}=\frac{3}{2}\pm\frac{\sqrt{3}}{2}$$

3. $x^2-6x+11=0$

$$x=\frac{-(-6)\pm\sqrt{(-6)^2-4\cdot 1\cdot 11}}{2\cdot 1}=\frac{6\pm\sqrt{36-44}}{2}=\frac{6\pm\sqrt{-8}}{2}=\frac{6\pm i\sqrt{4}\sqrt{2}}{2}=\frac{6\pm i2\sqrt{3}}{2}=\frac{\cancel{2}(3\pm i\sqrt{3})}{\cancel{2}}=3\pm\sqrt{3}\ i$$

Or (also correct)

$$x=\frac{-(-6)\pm\sqrt{(-6)^2-4\cdot 1\cdot 11}}{2\cdot 1}=\frac{6}{2}\pm\frac{\sqrt{36-44}}{4}=\frac{\cancel{6}3}{\cancel{2}}\pm\frac{\sqrt{-8}}{2}=3\pm\frac{i\sqrt{4}\sqrt{2}}{2}=3\pm\frac{\cancel{2}i\sqrt{3}}{\cancel{2}}=3\pm\sqrt{3}\ \ i$$

4. $x^2+4x+49=0$

$$x=\frac{-4\pm\sqrt{(4)^2-4\cdot 1\cdot 49}}{2\cdot 1}=\frac{-4\pm\sqrt{16-196}}{2}=\frac{-4\pm\sqrt{-180}}{2}=\frac{-4\pm i\sqrt{9}\sqrt{4}\sqrt{5}}{2}=\frac{-4\pm i\cdot 3\cdot 2\sqrt{5}}{2}=\frac{\cancel{2}(-2\pm 3i\sqrt{5})}{\cancel{2}}$$

$$=-2\pm 3\sqrt{5}\ i$$

Or (also correct)

$$x=\frac{-(4)\pm\sqrt{(4)^2-4\cdot 1\cdot 49}}{2\cdot 1}=\frac{-4}{2}\pm\frac{\sqrt{16-196}}{4}=\frac{\cancel{-4}(-2)}{\cancel{2}}\pm\frac{\sqrt{-180}}{2}=-2\pm\frac{i\sqrt{9}\sqrt{4}\sqrt{5}}{2}=-2\pm\frac{i\cdot 3\cdot\cancel{2}\sqrt{5}}{\cancel{2}}=-2\pm 3\sqrt{5}\ \ i$$

5. $\frac{x^2}{(.25-x)(.3-x)} = .15$

$\frac{(.25-x)(.3-x)}{1} \cdot \frac{x^2}{(.25-x)(.3-x)} = .15 \cdot \frac{(.25-x)(.3-x)}{1}$

$x^2 = .15 \cdot (.25-x)(.3-x)$

$x^2 = .15 \cdot (.075 - .25x - .3x + x^2)$ **Note:** We were doing this in class when someone asked about this step, and changed my answer, and then after class I realized (thanks other student editor!) that it was correct the first time. So: .25 is multiplied by -x, and .3 is also multiplied by -x, so I get -.25x+ -.3x = -.55x. If that still looks wrong to you, try rewriting it as -.25x+ -.30x = -.55x

$x^2 = .15 \cdot (.075 - .55x + x^2)$

$x^2 = 0.01125 - 0.0825 + .15x^2$

Now subtract to get everything either on the left or the right of the equals sign. Both of these are correct:

$.85x^2 + 0.0825 - 0.01125 = 0$ OR $0 = -.85x^2 - 0.0825 + 0.01125 = 0$ (Note that 1-.15=.85)

Write out the quadratic formula for whichever quadratic you have:

$x = \frac{-(.0825) \pm \sqrt{(.0825)^2 - 4 \cdot 0.85 \cdot (-0.01125)}}{2 \cdot 0.85}$ OR $x = \frac{(.0825) \pm \sqrt{(-.0825)^2 - 4 \cdot (-0.85) \cdot (0.01125)}}{2 \cdot (-0.85)}$

Check out one of the videos to see a good way to plug this into your calculator.

Store .85 -> a

Store .0825 -> b

Store -.01125 ->c

Calculate 4*a*c and store it in d

Calculate b^2-d and store it in d

Calculate -1*b+√d (enter)

Divide: /(2*a) Write down 0.076

Calculate -1*b-√d (enter)

Divide: /(2*a) Write down -.17

6. $\dfrac{x^2}{(.2-x)(.18-x)} = .12$

$$\frac{\cancel{(.2-x)(.18-x)}}{1} \cdot \frac{x^2}{\cancel{(.2-x)(.18-x)}} = .12 \cdot \frac{(.2-x)(.18-x)}{1}$$

$$x^2 = .12 \cdot (.2-x)(.18-x)$$

$$x^2 = 0.12(.09 - .2x - .18x + x^2)$$

$$x^2 = 0.12(.09 - .38x + x^2)$$

$$x^2 = 0.0108 - 0.0456x + 0.12x^2$$

$$x^2 - 0.0108 + 0.0456x - 0.12x^2 = 0$$

$$0.88x^2 + 0.0456x - 0.0108 = 0$$

Write down the quadratic formula before plugging in to your calculator to get the most points:

$$x = \frac{-(0.0456) \pm \sqrt{(0.0456)^2 - 4 \cdot 0.88 \cdot (-0.0108)}}{2 \cdot 0.88}$$

Store .88 -> a
Store .0456 -> b
Store -.0108 ->c
Calculate 4*a*c and store it in d
Calculate b^2-d and store it in d
Calculate -1*b+√d (enter)
Divide: /(2*a) Write down .088
Calculate -1*b-√d (enter)
Divide: /(2*a) Write down -.14

7. $\dfrac{x^2}{(.25-x)(.15-x)} = .3$

$$\frac{\cancel{(.25-x)(.15-x)}}{1} \cdot \frac{x^2}{\cancel{(.25-x)(.15-x)}} = .3\cdot(.25-x)(.15-x)$$

$$x^2 = .3\cdot(.25-x)(.15-x)$$

$$x^2 = .3\cdot(.0375-.25x-.15x+x^2)$$

$$x^2 = 0.3(0.0375-0.40x+x^2)$$

$$x^2 = 0.01125-0.12x+0.3x^2$$

$$x^2-0.3x^2+0.12x-0.01125=0$$

$$0.7x^2+0.12x-0.01125=0$$

$$x=\frac{-(0.12)\pm\sqrt{(0.12)^2-4\cdot0.7\cdot(-0.01125)}}{2\cdot0.7}$$

X=.67 or -.24