1. $\log(x) + \log(x-48) = 2$
2. $\log_2(x+14) + \log_2(x+18) = 5$
3. $\log_8(x+6) + \log_8(x+3) = 2$
4. $\log(x-1) - \log(x+8) = \log(x-6) - \log(x+9)$
5. $5^{-x} = 2.1$
6. $3^x = 7$
7. $5^{7x} = \frac{1}{3}$

Nov 13-7:44 AM

Team #1 2+3i

$x^4 - 11x^3 + 35x^2 - 7x - 54$

Team #2

$2x^4 - 13x^3 + 36x^2 - 43x + 14$

Team #3

$3x^4 - 13x^3 + 30x^2 - 36x + 16$

Team #4

$x^4 - 7x^3 + 25x^2 - 41x + 22$

Team #5

$x^4 - 10x^3 + 36x^2 - 62x + 35$

Team #6

$x^4 + 2x^3 - 8x^2 + 6x + 63$

1. Find all real zeros
2. Factor over field of real numbers.
3. Find the rest of the zeros (nonreal complex)
4. Factor over the field of complex numbers.

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(1) Rational Zeros
(2) Descartes' Rule
(3) Synthetic Division Guesses
(4) Repeat, on depressed equation.

Nov 13-7:53 AM

§5.1#45

$100(.05x + .1y = .6) \Longrightarrow 5x + 10y = 60$

$x + 2y = 12 \Longrightarrow x = 12 - 2y$

Same Line

$5(12-2y) + 10y = 60$

$60 - 10y + 10y = 60$

$60 = 60$ Tautology = Vacuous truth

= true, regardless of value of variable.

$\mathrm{I} \quad x + 2y = 12$

$\mathrm{II} \quad 5x + 10y = 12$

$-5\mathrm{I} \quad -5x - 10y = -60$

$\mathrm{II} \quad 5x + 10y = 12$

$0 = -48$

ABSURD

This is a contradiction of the assumption that there's a solution

Parallel Lines

Assume there's a solution

Make your moves

Arrive at an absurdity

Conclude there is no solution

Clay saw it!

$\mathrm{I} \quad x + 2y = 12$

$\mathrm{II} \quad 5x + 10y = 60$

$-5\mathrm{I} \quad -5x - 10y = -60$

$\mathrm{II} \quad 5x + 10y = 60$

$0 = 0$

Same Line

$\{(x,y) \mid x + 2y = 12\}$ is the general solution.

$= \{(x,y) \mid 5x + 10y = 60\}$

$3x^4 - 23x^3 + 5x^2 + 249x - 162$

ps: 162
qs: 3

$\pm 1, \pm\frac{1}{3}, \pm 2, \pm\frac{2}{3},$
$\pm 3, \cancel{\pm\frac{3}{3}}, \pm 6, \cancel{\pm\frac{6}{3}},$
$\pm 9, \cancel{\pm\frac{9}{3}}, \pm 18, \cancel{\pm\frac{18}{3}},$
$\pm 27, \pm 54, \pm 81, \pm 162$

2|162
3|81
3|27
3|9
3

2, 3, 6, 9, 18, 27, 54, ouch! 81, 162

Descartes: 3 or 1 positive zeros.

$f(-x) = 3x^4 + 23x^3 + 5x^2 - 249x - 162$

1 negative zero.

```
-3 | 3  -23    5   249  -162
          -9   96  -303   162
   ---------------------------
2/3| 3  -32  101   -54     0
            2  -20    54
   ---------------------------
     3  -30   81     0
```

$\frac{2}{3}\cdot\cancel{30}^{10}$

$\frac{2}{3}\cdot 121$

$\frac{2}{3}\cdot 81 = 2\cdot 27$

$$\boxed{\begin{array}{l}(x+3)\left(x-\frac{2}{3}\right)(3x^2-30x+81)\\ \text{Real zeros: } x=-3,\ x=\frac{2}{3}\end{array}}$$

$3x^2 - 30x + 81 = 0$

$\Rightarrow 3(x^2 - 10x + 27) = 0$

$\Rightarrow x^2 - 10x + 27 = 0$

$a = 1, b = -10, c = 27$

$b^2 - 4ac = (-10)^2 - 4(1)(27)$

$= 100 - 108$

$= -8 \rightarrow \sqrt{-8} = i2\sqrt{2}$

27 × 4 = 108

$x = \frac{10 \pm 2i\sqrt{2}}{2} = \boxed{5 \pm i\sqrt{2}}$ nonreal.

$3(x+3)\left(x-\frac{2}{3}\right)\left(x-(5+i\sqrt{2})\right)\left(x-(5-i\sqrt{2})\right)$