

Questions?

MIDTERM Test Friday - Mostly $\mathbb{C}1, \mathbb{C}2$.

Some $\mathbb{C}3$, plus take-home over wknd
on $\mathbb{C}3$.

$\mathbb{C}3$ ① Use Remainder Thm to find $P(3)$

$$\text{for } P(x) = x^5 - 4x^4 + 13x^3 - 11x^2 + 5x - 20$$

② Based on #1, is $x-3$ a factor of $P(x)$?

③ Find a polynomial of minimum degree
in factored form with real coefficients,
and zeros at $x=1, -5, 2+3i$.

Here's a more or less standard take-home!

<http://www.harryzaims.com/121-online/121-online-fall-13/tests-u-took/121-online-test-3-take-home-and-solns-spring-13.pdf>

③ $(x-1)(x+5)(x-(2+3i))(x-(2-3i))$ STOP!

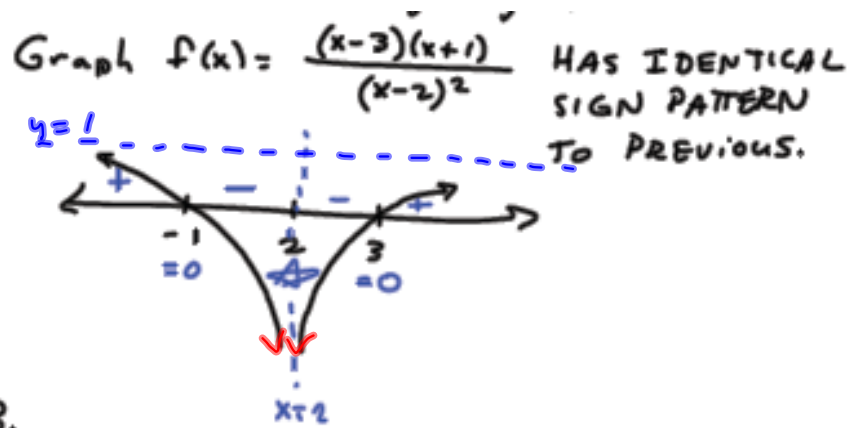
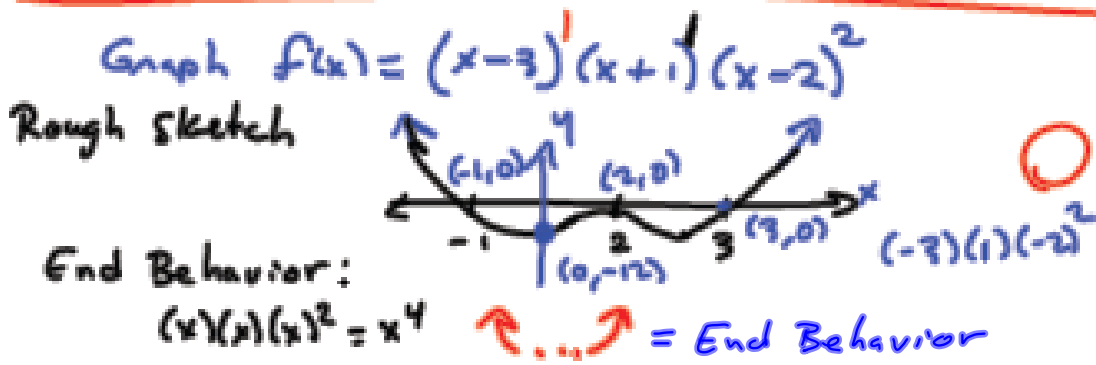
Zeros occur in Conjugate Pairs, when coefficients
are real:

④ Multiply $x-(2+3i)$ and $x-(2-3i)$ Conjugate Pair.

Conjugate Pairs
Theorem

$$\begin{aligned} &= x^2 - (2-3i)x - (2+3i)x + \underbrace{(2+3i)(2-3i)}_{=a^2+b^2} \\ &= x^2 - 2x + 3ix - 2x - 3ix + \underline{\underline{2^2+3^2}} \end{aligned}$$

$$= x^2 - 4x + 13$$



$$\frac{(x-3)(x+1)}{(x-2)^2} \approx \frac{(x)(x)}{x^2} = 1 \text{ for } |x| \text{ Big.}$$

This works, when degree of numerator and denominator are the same. Just cross out constant + terms.

$$\frac{\cancel{(x)}\cancel{(x)}}{\cancel{(x)}^2} = \frac{x^2}{x^2} = 1 \Rightarrow \boxed{y = 1 \text{ is H.A.}}$$

I can do a job in 5 hours.

How much of the job is done in 3 hrs?

$$\frac{3}{5} \text{ job.}$$

$$\frac{1}{5} \frac{\text{job}}{\text{hr}} \cdot 3 \text{ hr} = \frac{3}{5} \text{ job.}$$

Keli can do same job in 3 hours.

How long does it take us working together?

$$\frac{1}{5}x + \frac{1}{3}x = 1 \text{ job}$$

Let x = the time (in hrs) that I spend working.

$$\frac{3x + 5x}{15} = 1$$

$$8x = 15$$

Paul da man

$$x = \frac{15}{8} = 1 \frac{7}{8} = 1 + \left(\frac{7}{8} \text{ hr}\right) \left(\frac{60 \text{ min}}{\text{hr}}\right)$$

$$= 1 \text{ hr } 26 \text{ min } 15 \text{ sec.}$$

1 hr 26 min to nearest minute.

$$\frac{(60)(7)}{8} = \frac{(15)(7)}{4} = \frac{105 \cdot 200}{4} = 26.25$$

I did $\left(\frac{1}{5}\right)\left(\frac{15}{8}\right)$ of the job \rightarrow 15 secs.

$$= \boxed{\frac{3}{8}}$$

Keli did $\left(\frac{1}{3}\right)\left(\frac{15}{8}\right) = \boxed{\frac{5}{8}}$ of the job.

I showed up 1 hr late.
 How many hours did I work?
 Keli work?

Let $x = \#$ of hrs I work
 $y = \#$ of hrs Keli works. $= x + 1$

$$\frac{1}{5}x + \frac{1}{3}y = 1$$

$$\frac{1}{5}x + \frac{1}{3}(x+1) = 1$$

$$\frac{3x + 5(x+1)}{15} = 1$$

$$\frac{3x + 5x + 5}{15} = \frac{15}{15}$$

$$8x + 5 = 15$$

$$8x = 10$$

$$x = \frac{10}{8} = \frac{5}{4} = 1.25 \text{ hr.} \rightarrow \frac{10}{8} = \frac{5}{4}$$

$$y = x + 1 = 1.25 + 1 = \boxed{2.25} \text{ hr.}$$

$$\frac{1}{5}(y-1) + \frac{1}{3}y = 1$$

$$\frac{3(y-1) + 5y}{15} = 1$$

$$3y - 3 + 5y = 15$$

$$8y = 18$$

$$y = \frac{18}{8} = \frac{9}{4} = 2\frac{1}{4}$$

Throw away denom-
inator.

WILL NOT BE ABLE
to throw it away in
the sequel.

3.5 hrs total work.

$1\frac{7}{8}$ together

$2\frac{1}{4}$ hrs when I'm late.

Seems wrong, but she worked
alone for 1 hr.

$$\text{cost} + .05 \text{cost} = \text{Total Cost after 5\% tax}$$

$$c + .05c = \text{Price @ checkstand.}$$

I paid \$50 at the checkstand & there's 5% sales tax. what's price b4 tax?

\$47.62 → To the nearest penny.

Let $x =$ price before tax.

$$\text{Then } x + .05x = 50$$

$$1.05x = 50$$

$$x = \frac{50}{1.05} \approx 47.6190476$$

$$\approx 47.62$$

When can you NOT throw away the denominator? Inequalities with variable expressions in the denominator.

$$\frac{x+1}{2x-1} \geq 1$$

What's wrong with this move:

$$x+1 \geq 2x-1 \quad ?$$

Because it's

$$x > \frac{1}{2}$$

$$x+1 \geq 2x-1$$

when $2x-1 > 0$

and it's

$$x < \frac{1}{2}$$

$$x+1 \leq 2x-1$$

when $2x-1 < 0$

Most Efficient Way!

- ① ~~0~~ ≥ 0 Get 0 on one side.
- ② Sign pattern

$$\frac{x+1}{2x-1} - 1 \geq 0$$

$$\frac{x+1}{2x-1} - \frac{1}{1} \cdot \frac{2x-1}{2x-1} \geq 0$$

$$\frac{x+1-(2x-1)}{2x-1} \geq 0$$

$$\frac{x+1-2x+1}{2x-1} \geq 0$$

$$\frac{-x+2}{2x-1} \geq 0$$

$$\begin{aligned} &-(x-2)' \\ &2(x-\frac{1}{2})' \end{aligned}$$

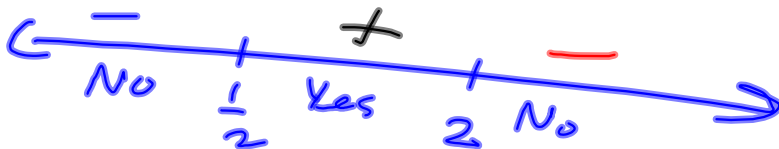
critical values:

$$-x+2=0$$

$$\underline{x=2}$$

$$2x-1=0$$

$$\underline{x=\frac{1}{2}}$$



$x = \frac{1}{2}, 2$ are zeros of multiplicity 1.
1 is odd. Sign changes.

$x \in [\frac{1}{2}, 2]$ ALMOST.

$x \in (\frac{1}{2}, 2]$, because $x = \frac{1}{2}$ is bad.

$x = \frac{1}{2} \notin D(\text{prob})$

$x = \frac{1}{2}$ makes denominator zero.

$$\boxed{\begin{aligned} &2x-1 \geq 0 \quad -x+2 \geq 0 \\ &\text{No!} \end{aligned}}$$

Continuing C3

Oblique Asymptote: when degree of numerator is greater than that of the denominator.