

121 G81-82 TEST 3 TAKE-HOME

$$f(x) = 6x^5 + 4x^4 - 35x^3 - x^2 + 64x - 20$$

① E.B. :  $6x^5$  ↙ ... ↗

② 3 or 1 positive zeros

$$f(-x) = -6x^5 + 4x^4 + 35x^3 - x^2 - 64x - 20$$

2 or 0 negative zeros.

③ P: -20, q: 6

$$\frac{P}{q} = \pm 1, \pm \frac{1}{2}, \pm \frac{1}{3}, \pm \frac{1}{6}, \pm 2, \pm \frac{2}{2}, \pm \frac{2}{3}, \pm \frac{2}{4},$$

$$\pm 4, \pm \frac{4}{2}, \pm \frac{4}{3}, \pm \frac{4}{6}, \pm 5, \pm \frac{5}{2}, \pm \frac{5}{3}, \pm \frac{5}{6},$$

$$\pm 10, \pm \frac{10}{2}, \pm \frac{10}{3}, \pm \frac{10}{6}, \pm 20, \pm \frac{20}{2}, \pm \frac{20}{3}, \pm \frac{20}{6}$$

④ Grapher shows  $x = -2$ ,  $m = \text{even}$ ;  $x = \frac{1}{3}$ ,  $m = \text{odd}$

|               |    |     |     |     |     |     |
|---------------|----|-----|-----|-----|-----|-----|
| $-2$          | +6 | 4   | -35 | -1  | +64 | -20 |
|               |    | +12 | 16  | 38  | -74 | 20  |
| $-2$          | 6  | -8  | -19 | 37  | -10 | 0   |
|               |    | -2  | 40  | -42 | 10  |     |
| $\frac{1}{3}$ | 6  | -20 | 21  | -5  | 0   |     |
|               |    | 2   | -6  | 5   |     |     |
|               | 6  | -18 | 15  | 0   |     |     |

$$x = -2, -2, \frac{1}{3}$$

$\frac{3 \pm i}{2}$  on next pg

$$(5) \quad f(x) = (x+2)^2 \left(x - \frac{1}{3}\right) (6x^2 - 18x + 15)$$

$$\frac{15}{6} = \frac{5}{2}$$

$$(6) \quad 6x^2 - 18x + 15 = 0$$

$$a=6, b=-18, c=15$$

$$b^2 - 4ac = (-18)^2 - 4(6)(15)$$

$$= 324 - 360 = -36$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{18 \pm \sqrt{-36}}{2(6)}$$

$$= \frac{18 \pm 6i}{12} = \frac{6(3 \pm i)}{6(2)} = \frac{3 \pm i}{2}$$

Check:

$$6x^2 - 18x + 15 = 0$$

$$x - x^2 - 3x + \frac{5}{2} = 0$$

$$x^2 - 3x = -\frac{5}{2}$$

$$x^2 - 3x + \left(\frac{3}{2}\right)^2 = -\frac{5}{2} + \frac{9}{4}$$

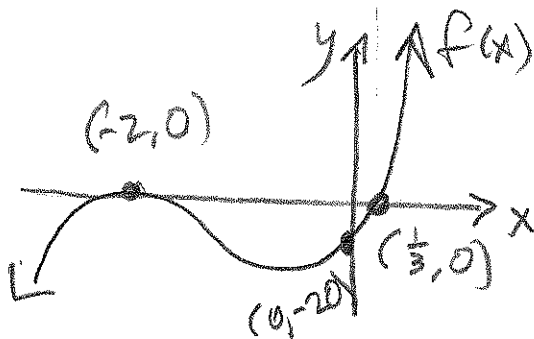
$$\left(x - \frac{3}{2}\right)^2 = -\frac{1}{4}$$

$$x - \frac{3}{2} = \pm \frac{1}{2}i$$

$$x = \frac{3 \pm i}{2}$$

$$f(x) = 6(x+2)^2 \left(x - \frac{1}{3}\right) \left(x - \left(\frac{3+i}{2}\right)\right) \left(x - \left(\frac{3-i}{2}\right)\right)$$

(7)



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$$\textcircled{8} R(x) = \frac{x^2 - 5x - 6}{x^2 - 5x + 6} = \frac{(x-6)(x+1)}{(x-3)(x-2)}$$

$$D = \mathbb{R} \setminus \{2, 3\}$$

$$\text{V.A.: } x=2, x=3$$

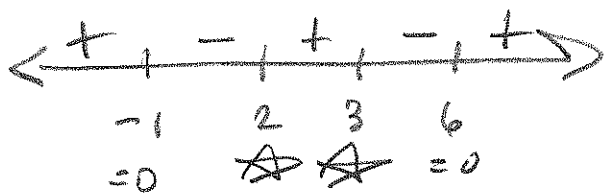
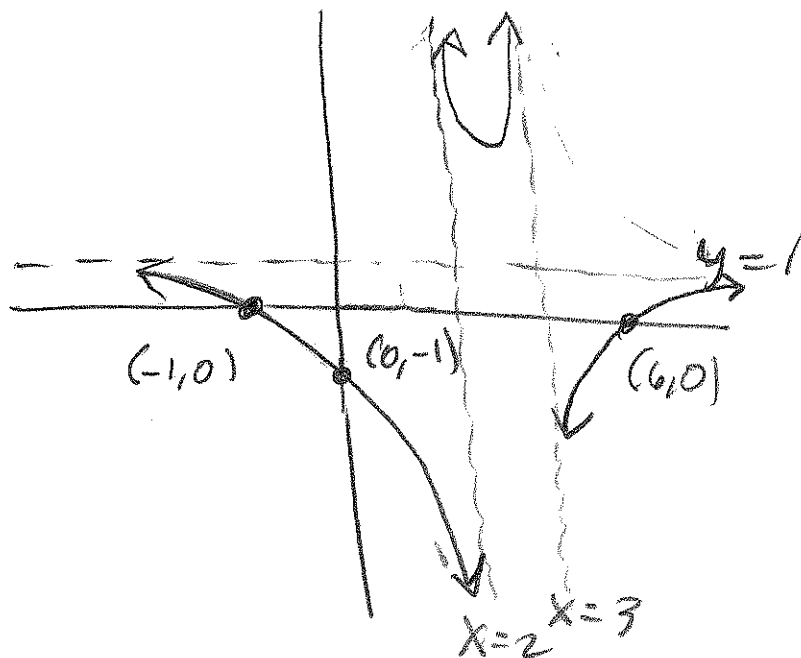
$$x\text{-int: } x=-1, x=6$$

$$\leadsto (-1, 0), (6, 0)$$

$$y\text{-int: } (0, -\frac{6}{6}) = (0, -1)$$

$$\text{H.A.: } y = \frac{x^2}{x^2} = 1$$

$$y=1$$



9) It says it's almost like #8, but for one small detail. I'm guessing it's a hole.

$$g(x) = \frac{x^3 - 9x^2 + 14x + 24}{x^3 - 9x^2 + 26x - 24} = \frac{(x+1)(x-6)(x-4)}{(x-2)(x-3)(x-4)} \quad \text{Hole @ } x=4$$

$$x^3 - 9x^2 + 14x + 24$$

$$\begin{array}{r|rrrr} 6 & 1 & -9 & 14 & 24 \\ & & 6 & -18 & -24 \\ \hline & 1 & -3 & -4 & 0 \end{array}$$

$$\begin{array}{r|rr} -1 & 1 & -3 & -4 \\ & & 4 & 4 \\ \hline & 1 & 1 & 0 \end{array}$$

$$\begin{array}{r} 1 & -4 & 0 \\ \hline \end{array}$$

$$(x-6)(x+1)(x-4)$$

$$x^3 - 9x^2 + 26x - 24$$

$$\begin{array}{r|rrrr} 2 & 1 & -9 & 26 & -24 \\ & & 2 & -14 & 24 \\ \hline & 1 & -7 & 12 & 0 \end{array}$$

$$\begin{array}{r|rr} 3 & 1 & -7 & 12 \\ & & 3 & -12 \\ \hline & 1 & -4 & 0 \end{array}$$

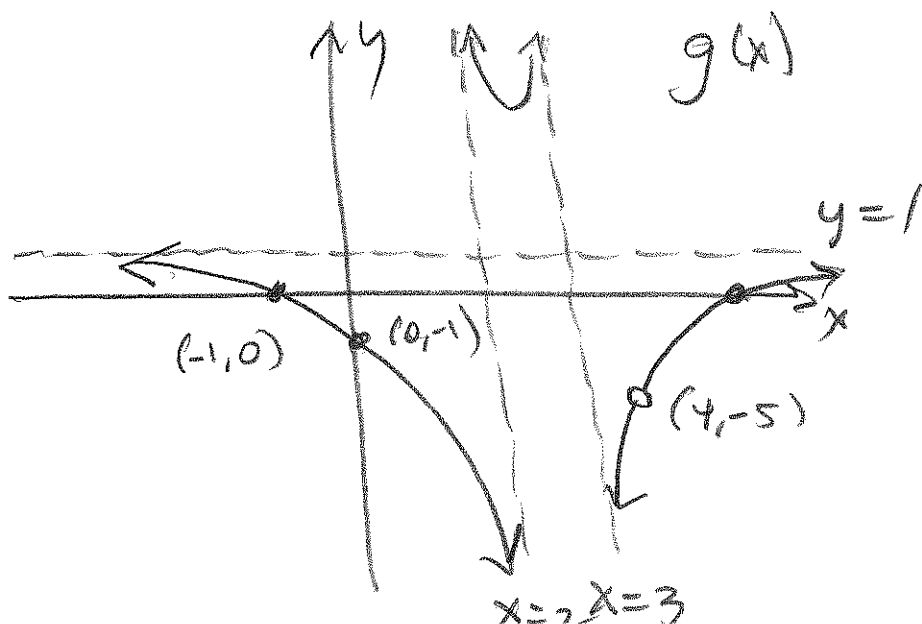
$$(x-2)(x-3)(x-4)$$

$$(x-2)(x-3)(x-4)$$

So  $g(x) = \frac{(x+1)(x-6)}{(x-2)(x-3)}$ , but  $x \neq 4$  is only new deal

$$\textcircled{1} x=4, R(x) = \frac{(4+1)(4-6)}{(4-2)(4-3)} = \frac{(5)(-2)}{(2)(1)} = \frac{-10}{2} = -5$$

so hole is @  $(4, -5)$



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(10)  $h(x) = \frac{2x^2 - 5x - 3}{x - 4} = \frac{(2x + 1)(x - 3)}{x - 4}$

$D = \mathbb{R} \setminus \{4\}$

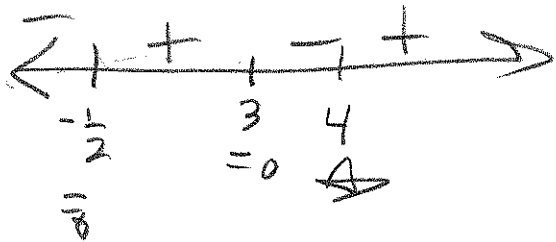
V.A. :  $x = 4$   
 $H.A. : (-\frac{1}{2}, 0), (3, 0)$

$H.A. : (0, -\frac{3}{4}) = (0, \frac{3}{4})$

H.A. : None

O.A. : Divide

$$\begin{array}{r} 4 \overline{) 2 \ - 5 \ - 3} \\ \underline{8 \phantom{00} \phantom{00}} \\ 2 \ 3 \ 9 \end{array}$$



$2x + 3 = 0$   
 $2x = -3$   
 $x = -\frac{3}{2}$

