Out of 43 points

MAC1140 Test 1 Name Key

Please show all work for credit. You may use your notes and graphing calculator for all questions on the exam. Your cell phone should be turned off and not on your desk at any time of the exam. Remember that a complete graph shows scale and end behavior and any other applicable features such as x intercepts, y intercepts, vertical asymptotes, holes, horizontal asymptotes, slant asymptotes, and multiplicity behavior.

(+6) 1. Show a complete graph of $f(x) = x^5 + 13x^3 - 2x^2 - 48x - 32$

$\frac{P}{Q}$ = possible rational zeros = $\frac{\pm1, \pm2, \pm4, \pm8 \pm16 \pm32}{\pm1}$ = $\pm1, \pm2, \pm4, \pm8, \pm16, \pm32$

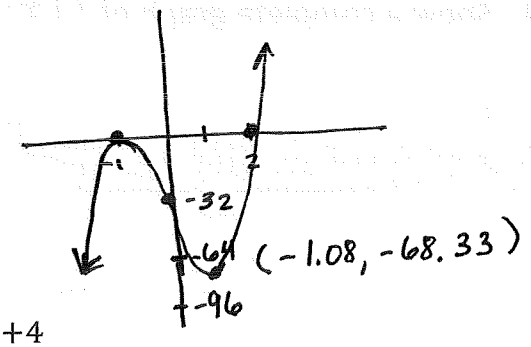
yint: $(0, -32)$

xint: $(2,0)$ $(-1,0)$ multiplicity 2

No holes or asymptotes

	1	0	13	-2	-48	-32
2		2	4	34	64	32
	1	2	17	32	16	☺
-1		-1	-1	-16	-16	
	1	1	16	16	☺	
-1		-1	0	-16		
	1	0	16	☺		

$x^2 + 16 \Rightarrow x = \pm 4i$



(+8) 2. Show a complete graph of $f(x) = \frac{3x^2+7x+4}{x^2-3x-4}$

$f(x) = \frac{(3x+4)(x+1)}{(x+1)(x-4)} = \frac{3x+4}{x-4}$

$x = -1$ hole $(-1, \frac{-1}{5})$

VA: $x \neq 4$

xint: $3x+4=0$ $x = \frac{-4}{3}$

$(\frac{-4}{3}, 0)$

yint: $(0, -1)$

HA: $y \neq 3$

no slant

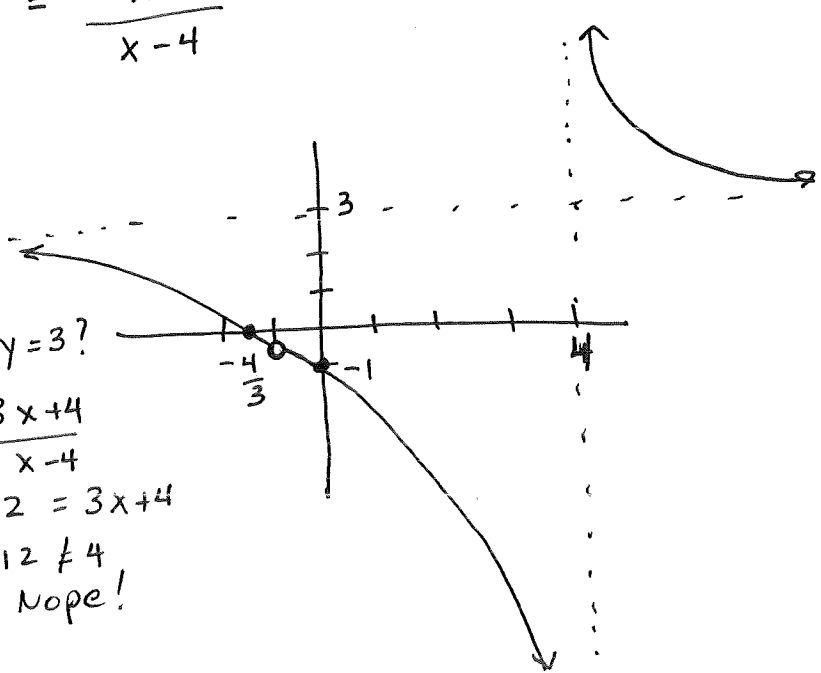
Cross $y=3$?

$3 = \frac{3x+4}{x-4}$

$3x - 12 = 3x + 4$

$-12 \neq 4$

Nope!



(+10) 3. Show a complete graph of $f(x) = \dfrac{x^2-4x-5}{x^2-16} = \dfrac{(x+1)(x-5)}{(x+4)(x-4)}$

VA: $(x+4)(x-4) \neq 0$

$x \neq \pm 4$

HA: $m = n \Rightarrow y = \frac{a}{b} = \frac{1}{1}$

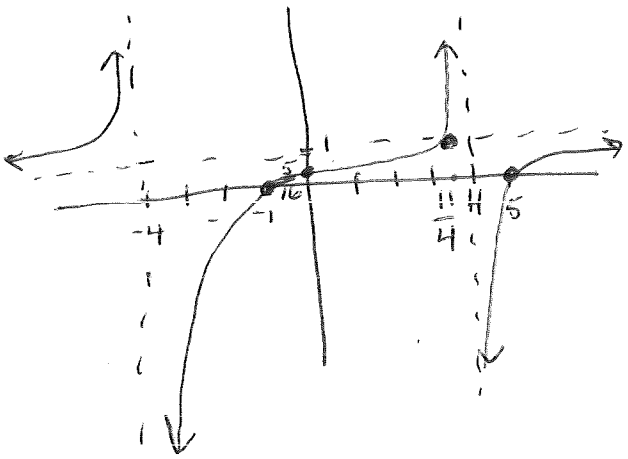
$y \neq 1$

no slant

x int: $(x+1)(x-5) = 0$

$x = -1, 5$ $(-1,0)$ $(5,0)$

y int: $y = \dfrac{0^2-4\cdot 0-5}{0^2-16} = \frac{5}{16}$ $(0, \frac{5}{16})$



cross $y = 1$?

$\dfrac{x^2-4x-5}{x^2-16} = 1$

$x^2-4x-5 = x^2-16$

$-4x = -11 \Rightarrow x = \frac{11}{4}$

(+10) 4. Show a complete graph of $f(x) = \dfrac{x^3-8}{x^2+8x+7} = \dfrac{(x-2)(x^2+2x+4)}{(x+1)(x+7)}$

VA: $(x+1)(x+7) \neq 0$

$x \neq -1, -7$

HA: $n > m$ none

x int: $(x-2)(x^2+2x+4) = 0$

$x = 2$ ↓ imaginary $(2,0)$

y int: $y = \dfrac{0^3-8}{0^2+8\cdot 0+7} = \frac{-8}{7}$ $(0, -\frac{8}{7})$

Slant: yes $m+1 = n$ $\quad x-8 = y$

$$\begin{array}{r|l} x^2+8x+7 & x^3+0x^2+0x-8 \\ & -x^3-8x^2-7x \\ \hline & -8x^2-7x-8 \\ & +8x^2+64x+56 \\ \hline & 57x+48 \end{array}$$

cross $x-8 = y$?

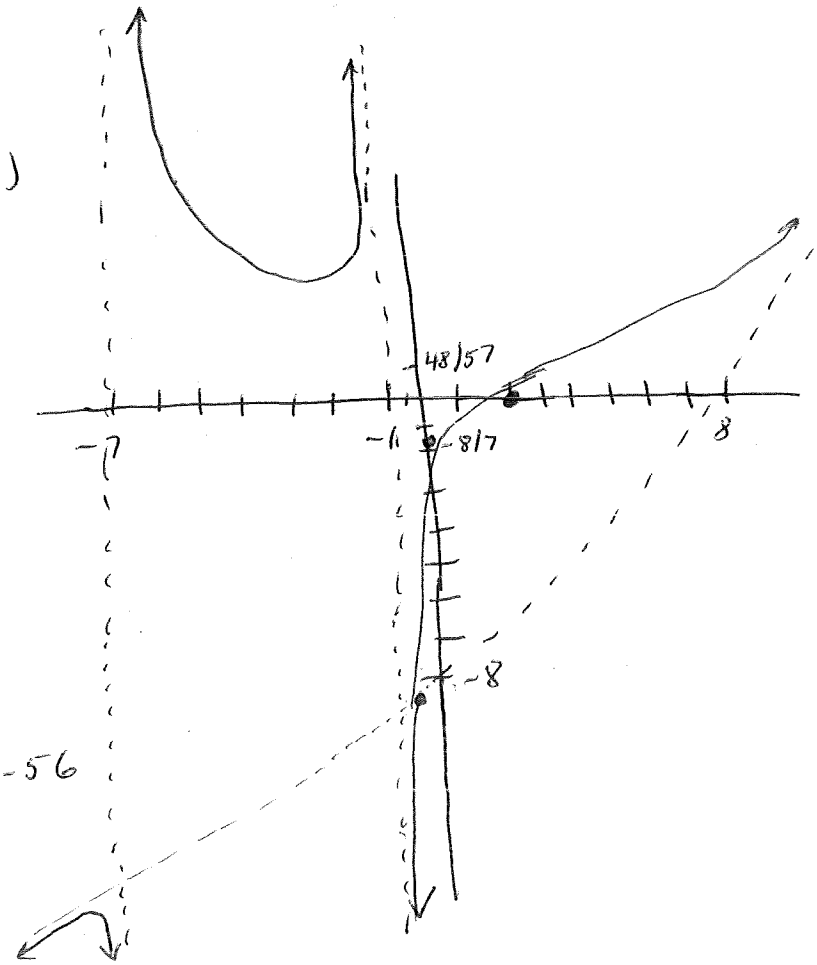
$\dfrac{x^3-8}{x^2+8x+7} = \dfrac{x-8}{1}$

$x^3-8 = (x-8)(x^2+8x+7)$

$x^3-8 = x^3+8x^2+7x-8x^2-64x-56$

$48 = -57x$

$x = \dfrac{-48}{57}$



+5

5. Find and simplify the Difference Quotient $= \frac{f(x+h)-f(x)}{h}$ for the function

$f(x) = \frac{3}{x}$

$$DQ = \frac{\frac{3}{x+h} - \frac{3}{x}}{h} = \frac{\frac{3x}{x(x+h)} - \frac{3(x+h)}{x(x+h)}}{\frac{h}{1}} = \frac{3x-3x-3h}{x(x+h)} \cdot \frac{1}{h}$$

$$DQ = \frac{-3\cancel{h}}{x(x+h)\cancel{h}} = \boxed{\frac{-3}{x(x+h)}}$$

+4

6. Solve for x. $|3x + 5| = 6$

$3x+5=6$ $\quad -5 \quad -5$

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

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

$3x+5=-6$ $\quad -5 \quad -5$

$\frac{3x}{3} = \frac{-11}{3}$

$x = \frac{-11}{3}$