

REGIS

0. THE FINAL EXAM FOR THIS CLASS IS

**MON/WED CLASS: 10:00 – 11:50 MONDAY, MAY 6**

**TUE/THU CLASS: 12:30 – 2:20 THURSDAY, MAY 9**

WHEN IS THE FINAL EXAM FOR THIS CLASS?

WRITE IT (THE WHOLE THING!) HERE →

(+1pt)

IMPORTANT: YOU MAY USE ONLY THE METHODS DISCUSSED IN CLASS. IF YOU USE METHODS NOT DISCUSSED IN CLASS OR IF YOU DO NOT SHOW YOUR WORK IN A NEAT AND ORDERLY FASHION, YOU FORFEIT YOUR CLAIM TO ANY CREDIT.

I. MULTIPLE CHOICE. WRITE IN THE BLANK SPACE THE LETTER CORRESPONDING TO THE CORRECT RESPONSE. PLEASE USE ONLY CAPITAL LETTERS. NOTE THAT THE SYMBOL " $\mathbb{R}$ " REPRESENTS "ALL REAL NUMBERS".

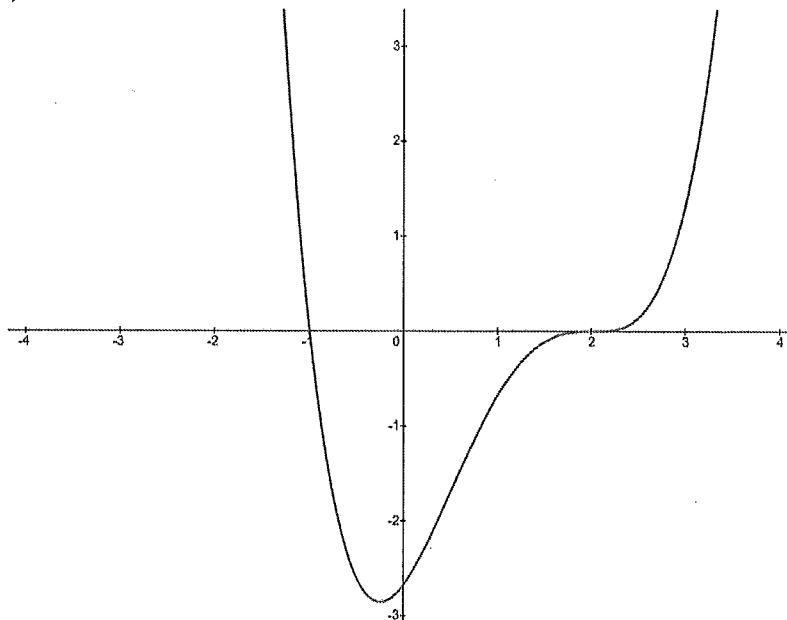
I. MULTIPLE CHOICE.

1. C WHAT IS THE Y-INTERCEPT FOR THE FUNCTION  $f(x) = (x-2)^2(x+1)$  ?  
A. (0, 2)      B. (4, 0)      C. (0, 4)      D. IT HAS NO Y-INTERCEPT      E. NONE OF THESE

2. E WHICH POINT IS AN X-INTERCEPT OF THE FUNCTION  $f(x) = (x-2)^2(x+1)$  ?  
A. (-2, 0)      B.  $(\sqrt{2}, 0)$       C. (1, 0)      D. (0, 2)      E. NONE OF THESE

3. D WHAT IS THE DEGREE OF THE FUNCTION  $f(x) = -4x^3 - 6x^5 + 7$  ?  
A. 4      B. -4      C. 3      D. 5      E. NONE OF THESE

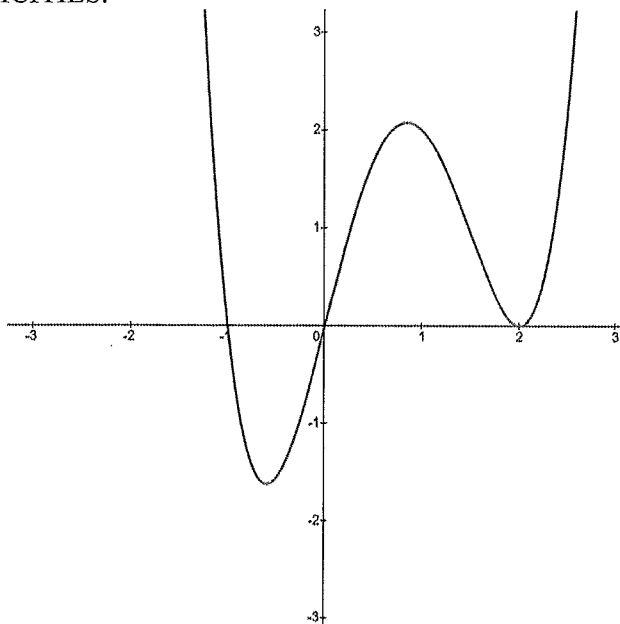
4. C THE POINT (2, 0) IS AN X-INTERCEPT OF THE GIVEN FUNCTION. WHAT IS ITS MULTIPLICITY?



A. 1      B. 2      C. 3      D. NOT ENOUGH INFORMATION IS GIVEN      E. NONE OF THESE

5. B WHEN WORKING WITH A RATIONAL FUNCTION, WHAT IS FOUND BY SETTING THE NUMERATOR EQUAL TO ZERO AND SOLVING?  
A. THE Y-INTERCEPT      B. THE X-INTERCEPT(S)      C. THE VERTICAL ASYMPTOTE(S)  
D. HORIZONTAL ASYMPTOTE      E. NONE OF THESE

6. C WHICH FUNCTION CORRESPONDS TO THE FOLLOWING GRAPH? HINT: FIND INTERCEPTS AND CHECK MULTIPLICITIES.



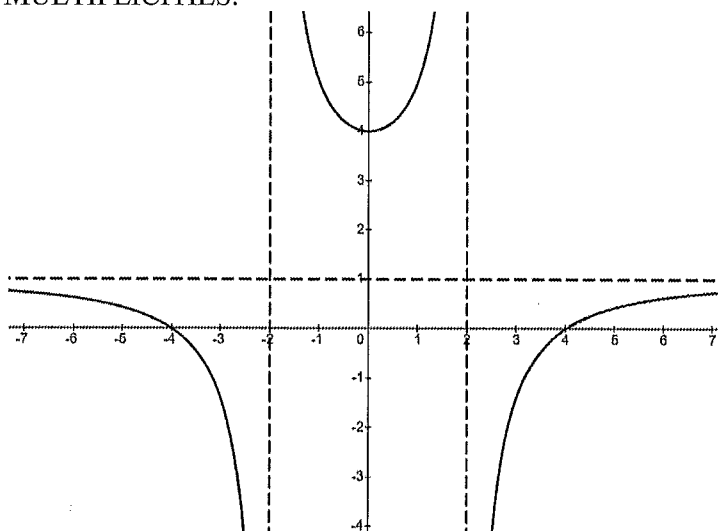
- A.  $f(x) = -x(x+1)(x-2)^2$     B.  $f(x) = x^2(x+1)(x-2)$     C.  $f(x) = x(x+1)(x-2)^2$   
 D.  $f(x) = x(x+1)^2(x-2)$     E. NONE OF THESE

7. B WHAT IS THE Y-INTERCEPT FOR THE FUNCTION  $f(x) = x^3 + 4x^2 - 5x + 5$  ?  
 A. (5,0)    B. (0,5)    C. (0,0)    D. IT HAS NO Y-INTERCEPT    E. NONE OF THESE

8. B WHERE ARE THE **VERTICAL** ASYMPTOTES FOR THE GRAPH OF  $f(x) = \frac{x^2 - 9}{x^2 - 4}$  ?  
 A.  $y = \pm 3$     B.  $x = \pm 2$     C.  $x = \pm 4$     D.  $y = \pm 2$     E. NONE OF THESE

9. C WHERE IS THE **HORIZONTAL** ASYMPTOTE FOR THE GRAPH OF  $f(x) = \frac{x^2 - 9}{x^2 - 4}$  ?  
 A.  $y = \pm 3$     B.  $x = \pm 2$     C.  $y = 1$     D.  $y = \pm 2$     E. NONE OF THESE

10. C WHAT FUNCTION HAS THE FOLLOWING GRAPH? HINT: LOOK FOR ASYMPTOTES, INTERCEPTS, AND MULTIPLICITIES.



- A.  $f(x) = \frac{x^2 - 4}{x^2 - 16}$     B.  $f(x) = \frac{x - 4}{x^2 - 4}$     C.  $f(x) = \frac{x^2 - 16}{x^2 - 4}$   
 D. NOT ENOUGH INFORMATION IS GIVEN    E. NONE OF THESE

II. CAREFULLY GRAPH OF EACH FUNCTION. BE SURE TO SHOW ALL YOUR WORK AS DEMONSTRATED IN CLASS. BE SURE TO

- STATE EACH STEP AS YOU DO IT
- PLOT ALL IMPORTANT VALUES AND
- LABEL ALL POINTS YOU PLOT!

1.  $f(x) = x^2 - 6x + 5$

⊗ Vertex  $x = -\frac{b}{2a}$   
 $= -\frac{-6}{2(1)}$   
 $= 3$

$y = f(3)$

$= (3)^2 - 6(3) + 5$   
 $= 9 - 18 + 5$   
 $= -4 \Rightarrow (3, -4)$

⊗ Ints

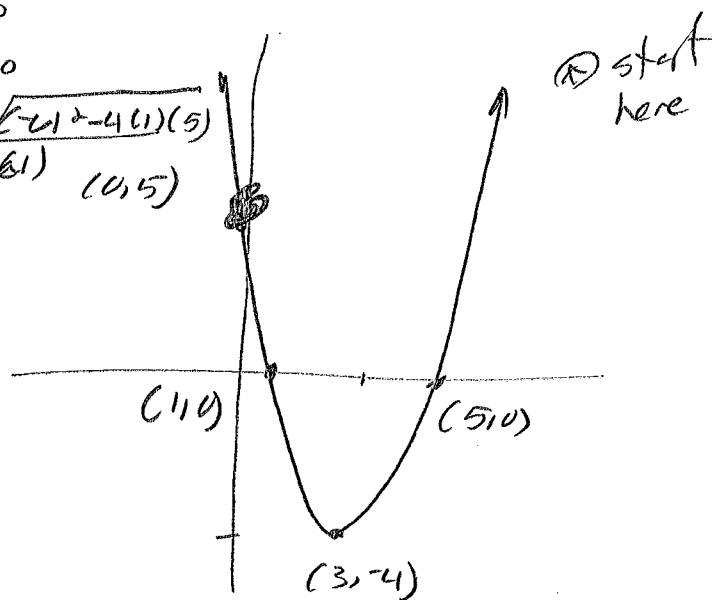
y-int set  $x=0$   
 $\Rightarrow f(0) = (0)^2 - 6(0) + 5$   
 $= 5 \Rightarrow (0, 5)$

x-int set  $f=0$   
 $\Rightarrow x^2 - 6x + 5 = 0$   
 $\Rightarrow x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(5)}}{2(1)}$   
 $= \frac{6 \pm \sqrt{36 - 20}}{2}$

$= \frac{6 \pm \sqrt{16}}{2}$

$= \frac{6 \pm 4}{2}$

$= \frac{10}{2} = 5$



2.  $f(x) = x^2(x-4)^3$

⊗ Degree  $2+3=5$  } → wavy arrow

⊗ Lead coef pos

⊗ Ints: y-int set  $x=0$

$f(0) = (0)^2(0-4)^3$   
 $= 0 \Rightarrow (0, 0)$

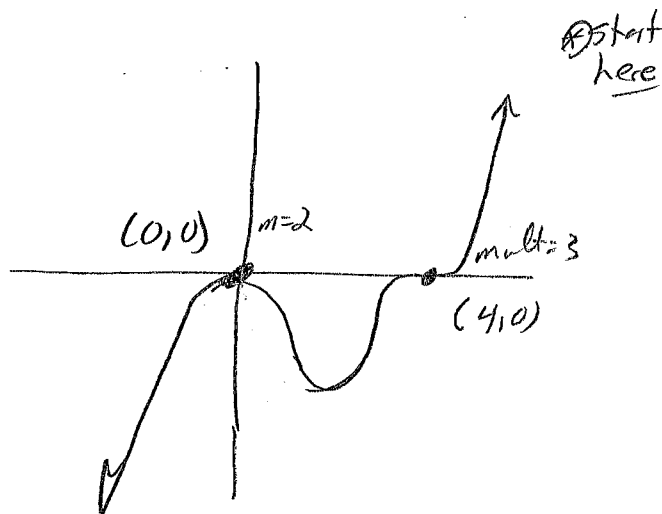
x-int set  $f=0$   
 $x^2(x-4)^3 = 0$

$x^2 = 0$        $(x-4)^3 = 0$

$x=0$        $x-4=0$   
 $(0, 0)$        $x=4$   
 $(4, 0)$

⊗ Mult.

2      3 ✓



# CONTINUE GRAPHING

3.  $f(x) = x^3 - x^2 - 9x + 9$

⊗ Degree: 3

⊗ L.C. pos.

⊗ y-int: set  $x=0$

$$f(0) = (0)^3 - (0)^2 - 9(0) + 9 = 9 \Rightarrow (0, 9)$$

⊗ x-int set  $f=0$

$$x^3 - x^2 - 9x + 9 = 0$$

$$\Rightarrow x^2(x-1) - 9(x-1) = 0$$

$$\Rightarrow (x-1)(x^2-9) = 0$$

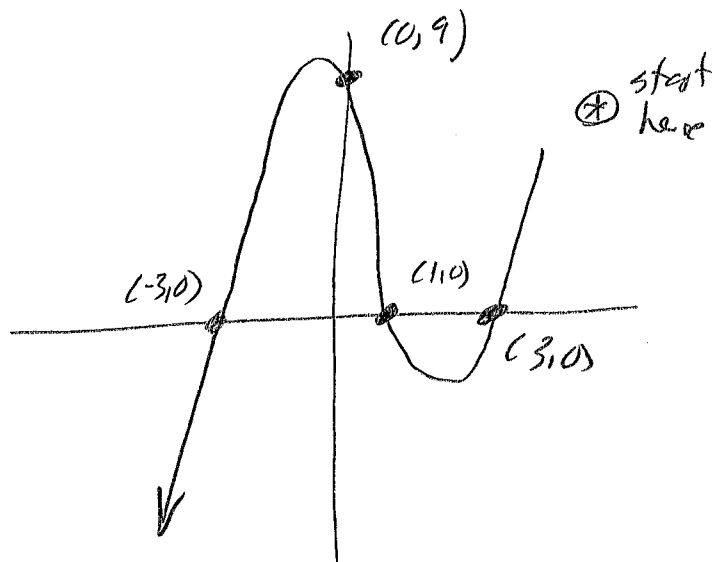
$$\Rightarrow (x-1)(x-3)(x+3) = 0$$

$$x=1 \quad x=3 \quad x=-3$$

$$(1, 0) \quad (3, 0) \quad (-3, 0)$$

⊗ mult.

$$1 \quad 1 \quad 1$$



4.  $f(x) = \frac{x-1}{x^2-16}$

⊗ Vert. asymp  
set denom = 0

$$x^2 - 16 = 0$$

$$(x-4)(x+4) = 0$$

$$x=4 \quad x=-4$$

⊗ Horiz. compare degrees

num  $\Rightarrow 1 \Rightarrow$  case I

denom  $\Rightarrow 2 \Rightarrow x$ -axis

⊗ y-int: set  $x=0$

$$f(0) = \frac{(0)-1}{(0)^2-16} = \frac{-1}{-16} = \frac{1}{16}$$

⊗ x-int: set num = 0  $\Rightarrow (0, \frac{1}{16})$

$$x-1=0 \Rightarrow x=1 \Rightarrow (1, 0) \text{ (mult=1)}$$

$$\text{⊗ Plot } f(-5) = \frac{(-5)-1}{(-5)^2-16} = \frac{-6}{9} \Rightarrow (-5, -\frac{2}{3}) \Rightarrow f(5) = \frac{(5)-1}{(5)^2-16} = \frac{4}{9} \Rightarrow (5, \frac{4}{9})$$

