

MAT1318A - Fall 2016

Midterm 2

Instructor: Luiz Cordeiro

November 7, 2016

Family name: _____

First name: _____

Student ID: _____

Question	Answer	Points
1		
2		
3		
4		
5		
6	_____	
7	_____	
8	_____	
Total	_____	

Please read the following structions carefully:

1. You have 80 minutes to complete this exam;
2. This is a closed book exam, and no notes of any kind are allowed. **Do not use your own scrap paper.** Use the back of pages for rough work;
3. Questions 1 through 5 are multiple choice. They are worth 1 point each, and no partial marks will be given. **Record your answers in the space provided above** (middle column);
4. Questions 6, 7 and 8 are long answer, and are worth 5 points each. **You answer should contain all reasoning and calculations, written legibly and logically. Answer your questions in the space provided.** Use the back of the page if necessary.

Problem 1. Consider the polynomial $P(x) = x^4 - 2x^3 + 2x^2 - 2x + 1$. Which of the following statements are true?

- I. $P(x)$ has 4 positive zeroes;
 - II. Every zero of $P(x)$ is positive;
 - III. $P(x)$ has no horizontal asymptotes;
 - IV. $x^2 + 1$ is a factor of $P(x)$.
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- A. I and II
 - B. I, II and IV
 - C. I, II and III
 - D. II and III
 - E. I and IV
 - F. None of the statements are true.

Problem 2. Find the horizontal (Hor) and vertical (Ver) asymptotes of the rational function

$$r(x) = \frac{x^2}{x^2 - 11x + 30}.$$

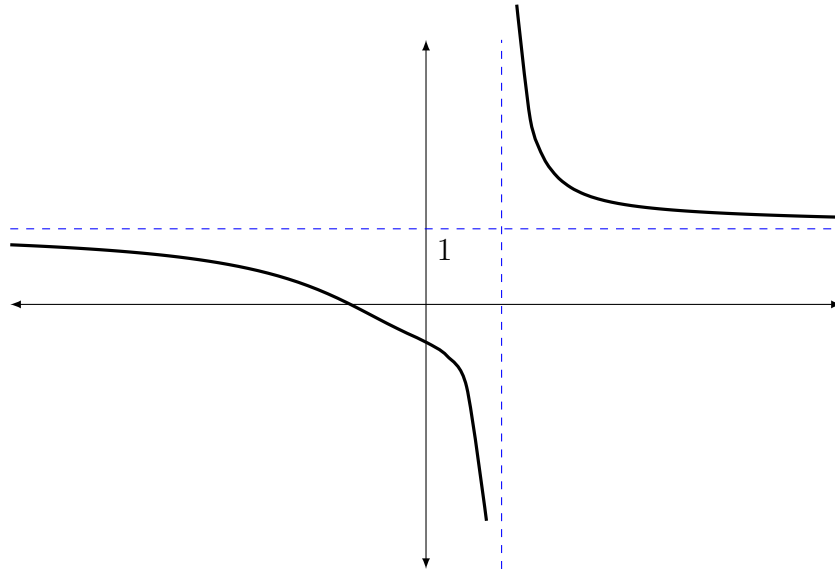
- A. Hor: $y = 1$, Ver: $x = 6, x = 5$;
- B. Hor: $y = 30, y = -11$, Ver: $x = 1$;
- C. Hor: $y = 30$, Ver: $x = 0$;
- D. Hor: $y = 0$, Ver: $x = 0$;
- E. Hor: $y = 1$, Ver: $x = -4$;
- F. None of the above.

Problem 3. Solve the equation

$$\log_4(x) + \log_4(x - 3) = 1.$$

- A. $x > 3$.
- B. $x = 4$ or $x = -1$.
- C. $x = 4$.
- D. $x = 0$ or $x = 3$.
- E. $x = 2$
- F. None of the above.

Problem 4. The graph of a rational function $r(x) = \frac{p(x)}{q(x)}$ (where $p(x)$ and $q(x)$ are polynomials) is given below:



Which of the following statements are true?

- I. The degree of $p(x)$ is smaller than the degree of $q(x)$; III. $q(x)$ has no zeroes;
 II. $y = 1$ is an asymptote of $r(x)$; IV. $p(x)$ has at least one zero.

- A. I, II and III D. I and III
 B. II and IV E. III and IV
 C. II, III and IV F. None of the above.

Problem 5. Find the inverse function of

$$f(x) = \frac{4^{x^3}}{2^{x^3}}$$

- A. $f^{-1}(x) = \log_4(x^3 - x)$ D. $f^{-1}(x) = \log_2(x^3)$
 B. $f^{-1}(x) = x^3 - 2x$ E. $f^{-1}(x) = \sqrt[3]{\log_2(x)}$
 C. $f^{-1}(x) = x^3 - x$ F. None of the above.

Problem 6. Find the domain of the following functions:

(a) $f(x) = \log(x^5 + 2x^4 - 13x^3 - 14x^2 + 24x)$.

(b) $g(x) = \sqrt{4^x - 2^x - 2}$.

Problem 7. Consider the rational function $r(x) = \frac{x^2}{x^2 - 11x + 30}$.

- (a) What are the x and y -intercepts of $r(x)$?
- (b) What are the vertical, horizontal, and/or slant asymptotes of $r(x)$?
- (c) Sketch the graph of $r(x)$.

Problem 8. Graph the function

$$f(x) = \log_4(3x - 2) - \log_2 x.$$