UF | UNIVERSITY of FLORIDA

Department of Mathematics

MAC 1140
Exam 4B
fall 2019

A. Sign your bubble sheet on the back at the bottom in ink.

B. In pencil, write and encode in the spaces indicated:

1) Name (last name, first initial, middle initial)

2) UF ID number

3) Section number

C. Under "special codes" code in the test ID numbers as shown below.

1 2 3 ● 5 6 7 8 9 0
1 ● 3 4 5 6 7 8 9 0

D. At the top right of your answer sheet, for "Test Form Code", encode B.

A ● C D E

E. 1) The time allowed is 120 minutes.

2) You may write on the test.

3) Raise your hand if you need more scratch paper or if you have a problem with your test. DO NOT LEAVE YOUR SEAT UNLESS YOU ARE FINISHED WITH THE TEST.

F. KEEP YOUR BUBBLE SHEET COVERED AT ALL TIMES.

G. When you are finished:

1) Before turning in your test **check carefully for transcribing errors**. Any mistakes you leave in are there to stay.

2) You must turn in your scantron and tearoff sheets to your discussion leader or exam proctor. Be prepared to show your picture I.D. with a legible signature.

3) The answers will be posted in Canvas within one day after the exam. Your discussion leader will return your tearoff sheet with your exam score in discussion. Your score will also be posted in Canvas within one week of the exam.

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Exam 1 Material

1. You are reviewing a model your company has to calculate the cost to modify one of your software packages for individual usage. You need to update the model due to inflation and changes in the industry, and you have developed a transform that does exactly this. In particular, the updated cost is calculated by $U(x) = 3.90C(x) - 170$, where $C(x)$ is the original cost. If a customer had originally been quoted a cost of \$600 for modifying 10 software packages, what would the updated cost be?
A) \$2170. **B)** \$21700. **C)** \$1970. **D)** \$217. **E)** \$197.

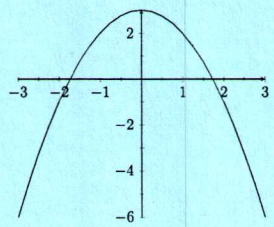
2. When someone calls you and they are in your contacts, your phone uses their phone number to display their name. What are the domain and codomain of this relationship?

A) Domain: phone numbers in your contacts; Codomain: names
B) Domain: names; Codomain: phone numbers
C) Domain: names in your contacts; Codomain: phone numbers
D) Domain: phone numbers; Codomain: names

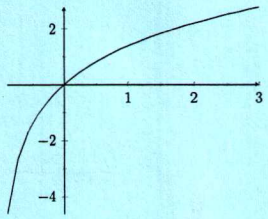
3. Suppose $f(x)$ has a zero at an x-value of 1.
What would a zero of $g(x)$ be if $g(x) = -7f(x+3)$?
A) 14 **B)** -2 **C)** 2 **D)** 4 **E)** 1

4. Which of the following graphs would most properly be said to have the parent function $f(x) = e^x$?

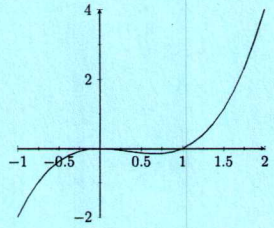
A)



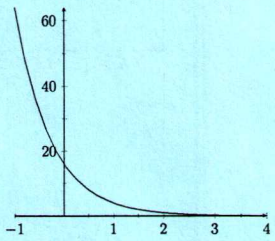
B)



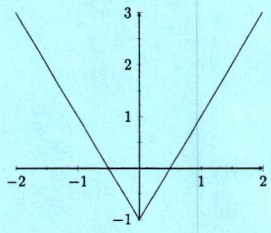
C)



D)



E)



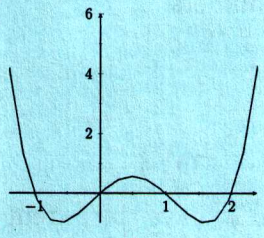
5. If the point $(2, 1)$ is on the graph of $f(x)$, then which point is on the graph of $g^{-1}(x)$ (the graph of g inverse) where $g(x) = -2f(-x-7)+2$?
A) (-2, -8) **B)** (1,2) **C)** (-9,0) **D)** (-8, -2) **E)** (0,-9)

6. What is the parent function of $g(x) = -2x^4 + 15x^5 + 6x^3 + x^2 + 14$?

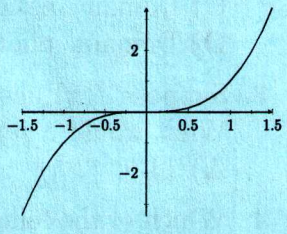
A) $f(x) = x^3$ **B)** $f(x) = x^5$ **C)** $f(x) = 15x^5$ **D)** $f(x) = -2x^4$
E) $f(x) = x^6$

7. Which of the following has an absolute maximum?

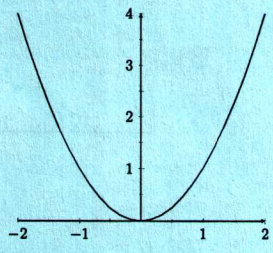
A)



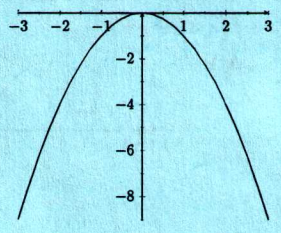
B)



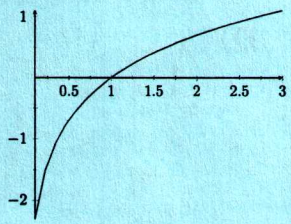
C)



D)

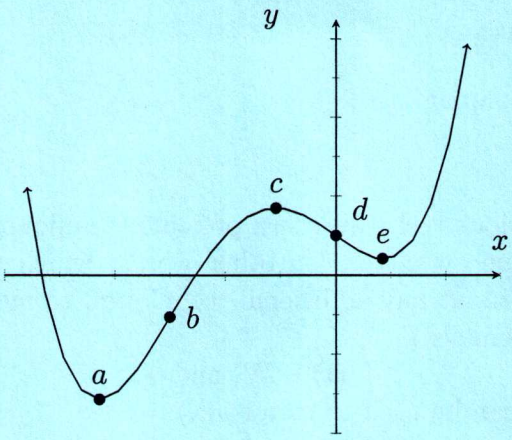


E)



Exam 2 Material

1. Consider the following graph of $f(x)$ for the next 2 questions.



Based on the number of extrema, what is the smallest degree possible for the leading term of f?

A) 6 **B)** 3 **C)** 5 **D)** 4

2. Within which of the following segments is the function **increasing** and concave **down**?

A) To the right of e **B)** Between a and b **C)** Between c and d
D) Between d and e **E)** Between b and c

3. What is the fully factored form (with real coefficients) for the polynomial $f(x) = x^6 - 729$? (Hint: $3^6 = 729$)

A) $(x^2-9)(x^4+9x^2+81)$ **B)** $(x-3)(x+3)(x^2+3x+9)(x^2-3x+9)$.
C) $(x-3)^4(x+3)^2$ **D)** $(x-3)^2(x+3)^4$ **E)** $(x-3)^3(x+3)^3$.

4. Consider the polynomial $p(x) = 4x^6 - 6x^5 + 2x^4 - 3x^3 - 12x^2 + 18x$ and the following techniques from class;

   I: Rational Root Theorem

   II: Completing the Square

   III: Synthetic Division

   IV: Factor by Grouping

   V: AC-Method

   Which of the previous techniques are possible techniques one could use as the **first factoring** technique on $p(x)$? (In other words, which of the above can you apply directly to $p(x)$ without any additional techniques, to factor $p(x)$ into the product of two or more polynomials.)

   A) IV. **B)** I, IV, and V. **C)** I, III, and V.
   D) None of these can be used to factor $p(x)$. **E)** I, II, and III.

5. What is the fully factored form (with real coefficients) for the polynomial $f(x) = x^4 - 2401$? (Hint: $7^4 = 2401$)

   A) $(x-7)^2(x+7)^2$.
   B) $x^4 - 2401$ (It is already irreducible with real coefficients).
   C) $(x-7)(x+7)^3$ **D)** $(x-7)(x+7)(x^2+49)$. **E)** $(x^2-49)(x^2+49)$

6. Consider the polynomial $p(x) = x^4 + 6x^3 - 40x^2 - 192x$. Which of the following are true?

   I: $p(x)$ is degree 4.

   II: $p(x)$ has 4 real zeros.

   III: The sum of the zeros of $p(x)$ is -6.

   IV: The product of the zeros of $p(x)$ is 0.

   A) Only I, II and IV are correct **B)** Only I, III, and IV are correct.
   C) All of these are correct. **D)** Only I is correct
   E) Only I and IV are correct

7. Consider the polynomial $p(x) = 9x^3 - 27x^2 - 16x + 48$. What is the sum of the zeros of $p(x)$?

   A) $\frac{9}{2}$ **B)** $\frac{17}{3}$ **C)** $\frac{1}{3}$ **D)** -3 **E)** 3

Exam 3 Material

1. What is the domain of function $f(x) = -3\ln(-2x - 14) + 1$?
   A) $[7, \infty)$ **B)** $(7, \infty)$ **C)** $(-\infty, -7)$ **D)** $(-\infty, 7]$ **E)** $(-\infty, 7)$

2. Which of the following is equivalent to the expression $\sqrt{125x^3y^6} - \sqrt{5x}$?
   A) $(5xy^3 - 1)\sqrt{5x}$ **B)** $5|xy^3|\sqrt{5x}$ **C)** $(5|xy^3 - 1|)\sqrt{5x}$
   D) $(5|xy^3| - 1)\sqrt{5x}$ **E)** $(5|xy^3| - 1)$

3. Use properties of logs to simplify the expression $\log_2(16xy^3) - \log_2(4xy)$.
   A) $\log_2(y)$ **B)** $2\log_2(4y)$ **C)** $2 + 2\log_2(y)$ **D)** $\frac{\log_2(16xy^3)}{\log_2(4xy)}$
   E) $2\log_2(y)$

4. What is the domain of the real-valued (ie no non-real numbers allowed) function $f(x) = 2\sqrt{-x+1} + 7$?
   A) $(-\infty, 1)$ **B)** $(-\infty, -1]$ **C)** $(-\infty, 1]$ **D)** $[1, \infty)$ **E)** $(1, \infty)$

5. You have a student loan that accrues interest at a 12% APR (annual percentage rate). If the interest is compounded weekly, what is the growth/decay multiplier in the exponential model of how much you owe on your loan?
   A) $\frac{3}{1300}$ **B)** $\frac{1303}{1300}$ **C)** 12 **D)** $\frac{1297}{1300}$ **E)** 1.12

6. Which of the following is the most condensed form of the following logarithmic expression: $\log_2(x^2) - 3\log_2(x+1) + 2\log_4(3x)$
   A) $\log_2\left(\frac{x^2}{(x+1)^3}\right) + \log_4(9x^2)$ **B)** $\log_2\left(\frac{3x^3}{(x+1)^3}\right)$ **C)** $\log_2\left(\frac{\sqrt{3}x^{\frac{5}{2}}}{(x+1)^3}\right)$
   D) $\log_2\left(\frac{9x^4}{(x+1)^3}\right)$ **E)** $\log_2\left(\frac{x^2}{(x+1)^3}\right) + 2\log_4(3x)$

7. Which of the following is equivalent to the expression $\frac{e^{2x^2} \cdot e^x}{\sqrt{e}}$?
   A) $e^{(2x^3 - \frac{x}{2})}$ **B)** $e^{(2x^2 + x - \frac{1}{2})}$ **C)** $e^{(2x^2 - \frac{x}{2})}$ **D)** e^{4x^3} **E)** $4x^3$

Additional Questions

1. Consider the function

$$f(x) = \begin{cases} -4x^2 & x \leq -5 \\ 3x+2 & -5 < x < 1 \\ 4x^2 - 1 & 1 \leq x \end{cases}$$

What is $f(3)$?

A) $f(3)$ cannot be computed with the given information. **B)** $f(3) = 11$
C) $f(3) = 35$ **D)** $f(3) = -4$ **E)** $f(3) = -36$

2. Which of the following inequalities best models the phrase "x is no more than 12 units from y"?

A) $|x - y| \leq 12$ **B)** None of the other answers are correct.
C) $|x - 12| \leq y$ **D)** $|x - 12| \geq y$ **E)** $|x - y| \geq 12$

3. Which of the following is a piecewise function definition of the function

$$f(x) = |4x - 2|$$

A) $f(x) = \begin{cases} 4x-2 & x < \frac{1}{2} \\ -4x+2 & \frac{1}{2} \leq x \end{cases}$

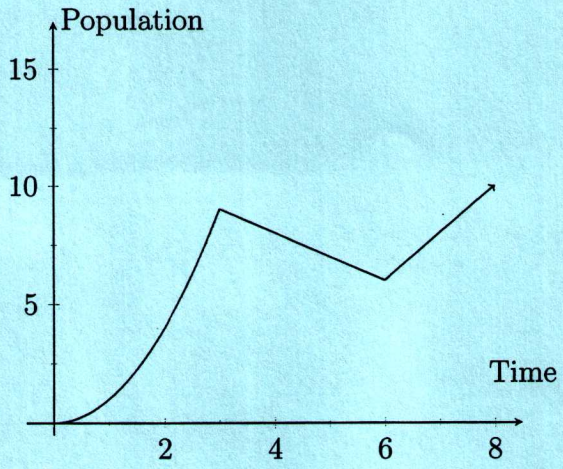
B) $f(x) = \begin{cases} -4x+2 & x < -\frac{1}{2} \\ 4x-2 & -\frac{1}{2} \leq x \end{cases}$

C) $f(x) = \begin{cases} 4x-2 & x < -\frac{1}{2} \\ -4x+2 & -\frac{1}{2} \leq x \end{cases}$

D) $f(x) = \begin{cases} -4x+2 & x < 0 \\ 4x-2 & 0 \leq x \end{cases}$

E) $f(x) = \begin{cases} -4x+2 & x < \frac{1}{2} \\ 4x-2 & \frac{1}{2} \leq x \end{cases}$

4. Consider the following graph:



Which of the following could be the function that generated the above graph? (**Hint:** Compare points on the graph to points of the function)

A) $f(x) = \begin{cases} 2x & x \leq 3 \\ x^2 & 3 < x < 6 \\ x+12 & 6 \leq x \end{cases}$

B) $f(x) = \begin{cases} -x+12 & x \leq 3 \\ x^2 & 3 < x < 6 \\ 2x-6 & 6 \leq x \end{cases}$

C) $f(x) = \begin{cases} x^2 & x \leq 3 \\ -x+12 & 3 < x < 6 \\ 2x-6 & 6 \leq x \end{cases}$

D) $f(x) = \begin{cases} x^2 & x \leq 3 \\ -x-12 & 1 < x < 4 \\ 2x-6 & 4 \leq x \end{cases}$

E) $f(x) = \begin{cases} x^2 & x \leq 3 \\ x+6 & 3 < x < 6 \\ 2x & 6 \leq x \end{cases}$