DO NOT WRITE ON THIS EXAM

MATH 110 - College Algebra

EXAM 2 October 4-10, 2018

Instructors: Robertson, McGhie, Lewis, Riddle, Woller

Instructions:

- Calculators and notes are not allowed.
- Do not write on this exam.
- Mark the correct answer on the bubble sheet provided.
- There is only one correct answer for each multiple choice question.
- There is no time limit.
- Please do not talk about the test with other students until after October 10.

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(1) Which of the following is NOT a polynomial?

(a) $\sqrt{2}x^2 + \pi x - 7$

(b) 3

(c) $x^3 - 8x$

(d) $x^{-1} + 2x^{\frac{1}{2}} - 3x^{\frac{3}{2}}$

(e) $x^4 + 1$

(f) $x^2 + 2x + 1$

(2) What is the degree of the following polynomial: $P(x) = 5(x-2)^2(x+4)^7(x+1)$?

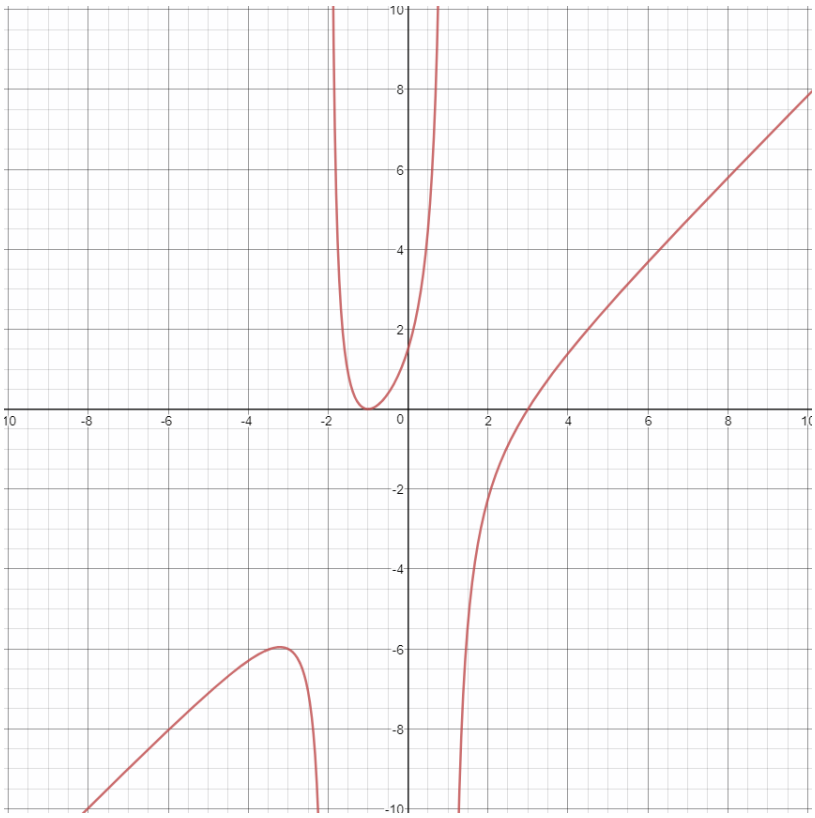
(a) 9
(b) 10
(c) 11
(d) 12
(e) 13
(f) 14

(3) Which statement is FALSE about the polynomial $P(x) = -3(x+1)^2(x-4)$:
   (a) Its smallest zero has multiplicity 2.
   (b) It has a maximum of 2 turning points.
   (c) It has degree 3.
   (d) It has a zero at $x = 1$.
   (e) It touches, but does not cross the x-axis at $x = -1$.
   (f) It crosses the x-axis at $x = 4$.

(4) What is the domain of $R(x) = \dfrac{x^2 + 8x + 16}{2x^2 - 2x - 4}$?
   (a) $(-\infty, -4) \cup (-4, -1) \cup (-1, 2) \cup (2, \infty)$
   (b) $(-\infty, -1) \cup (-1, \infty)$
   (c) $(-\infty, -1) \cup (-1, 2) \cup (2, \infty)$
   (d) $(1, 2)$
   (e) $(-4, 2)$
   (f) $(-\infty, -4) \cup (-4, 2) \cup (2, \infty)$

(5) List all of the asymptotes of $R(x) = \dfrac{-5x}{x-2}$:
   (a) Vertical: $x = 2$; Horizontal: $y = -5$
   (b) Vertical: $x = -5$; Horizontal: $y = 2$
   (c) Vertical: $x = 0$; Horizontal: $y = 2$
   (d) Vertical: $x = -5$; Oblique: $y = 2x$
   (e) Vertical: $x = 2$; Oblique: $y = -5x$
   (f) Vertical: $x = 2$; Oblique: $y = x$

(6) Given the following graph, find a rational function that has the given graph.



(a) $R(x) = \dfrac{(x+3)(x-1)^2}{(x+1)(x-2)}$

(b) $R(x) = \dfrac{(x-3)(x+1)}{(x-1)(x+2)}$

(c) $R(x) = \dfrac{(x-3)^2(x+1)}{(x-1)^2(x+2)}$

(d) $R(x) = \dfrac{(x+3)(x-1)}{(x+1)(x-2)}$

(e) $R(x) = \dfrac{(x-3)(x+1)^2}{(x-1)(x+2)}$

(f) $R(x) = \dfrac{(x+3)^2(x-1)}{(x+1)^2(x-2)}$

(7) What are the domain and range of the function in Problem (6)?
   (a) Domain and Range are all real numbers
   (b) Domain = All real numbers, Range = $(-\infty, -2) \cup (-2, 1) \cup (1, \infty)$
   (c) Domain = $(-\infty, -2) \cup (-2, 1) \cup (1, \infty)$, Range = $(-\infty, -2) \cup (-2, 1) \cup (1, \infty)$
   (d) Domain = $(-\infty, -2) \cup (-2, 1) \cup (1, \infty)$, Range = $(-\infty, -1) \cup (-1, 3) \cup (3, \infty)$
   (e) Domain = $(-\infty, -1) \cup (-1, 3) \cup (3, \infty)$, Range = $(-\infty, -1) \cup (-1, 3) \cup (3, \infty)$
   (f) Domain = $(-\infty, -2) \cup (-2, 1) \cup (1, \infty)$, Range = All real numbers

(8) What are the x and y intercepts of $f(x) = 6x^3 + 18x^2 + 12x$

   (a) x-intercepts: $-2, -1, 0$; y-intercept: 0
   (b) x-intercepts: $0, 1, 2$; y-intercept: 0
   (c) x-intercepts: $-2, -1, 0$; y-intercept: None
   (d) x-intercepts: $0, 1, 2$; y-intercept: None
   (e) x-intercepts: $6, 12$; y-intercept: 18
   (f) x-intercepts: $6, 18$; y-intercept: 12

(9) Find the oblique asymptote for $R(x) = \dfrac{x^3 - 5}{x^2 + 4x + 5}$
   (a) $y = x + 4$
   (b) $y = x + 5$
   (c) $y = x - 5$
   (d) $y = x - 4$
   (e) $y = x$
   (f) $y = -x$

(10) Solve the inequality $x^3 > x$.
   (a) $(-\infty, -1) \cup (0, 1)$
   (b) $(-1, 0) \cup (1, \infty)$
   (c) $(0, \infty)$
   (d) $(-\infty, -1) \cup (1, 2)$
   (e) $(-2, -1) \cup (1, \infty)$
   (f) $(-\infty, 0)$

(11) Solve the inequality $\dfrac{x^2-1}{x^2+10x+24} \leq 0$.

(a) $(-\infty, -6) \cup [1, \infty)$
(b) $[-1, 1] \cup [4, 6]$
(c) $(-6, -4) \cup [-1, 1]$
(d) $(-\infty, -6) \cup [4, 6]$
(e) $(-1, 1) \cup (4, \infty)$
(f) $(-\infty, -6) \cup (-4, -1) \cup (1, \infty)$

(12) Solve the inequality $\dfrac{x^2+2}{x} > 3$.

(a) $(1, 2)$
(b) $(-\infty, 0) \cup (1, 2)$
(c) $(0, 1) \cup (2, \infty)$
(d) $(0, 1)$
(e) $(2, \infty)$
(f) $(-\infty, 0)$

(13) Use the Remainder Theorem to find the remainder of $f(x) = x^3 - 4x + 7$ divided by $x + 2$.

(a) 7 (c) 9 (e) 11

(b) 8 (d) 10 (f) 12

(14) List all the possible rational zeroes of the polynomial $P(x) = 2x^5 - 12x^3 + x^2 - 5$.

(a) ± 1 (c) $\pm 1, \pm 5, \pm \frac{1}{2}$ (e) $\pm \frac{5}{2}$

(b) $\pm 1, \pm 5$ (d) $\pm 1, \pm 5, \pm \frac{5}{2}$ (f) $\pm 1, \pm 5, \pm \frac{1}{2}, \pm \frac{5}{2}$

(15) Find all the real zeros of $f(x) = x^3 - 4x^2 - 11x - 6$

(a) $-11, -4$ (c) -11 (e) $-1, 6$

(b) -4 (d) -1 (f) 6

(16) On which interval does the Intermediate Value Theorem guarantee a zero for the polynomial $P(x) = x^3 - 6x^2 + 12x - 8$?

(a) $[-5, -3]$ (d) $[-3, -1]$

(b) $[5, 7]$ (e) $[-1, 1]$

(c) $[3, 5]$ (f) $[1, 3]$

(17) Find the complex zeroes of $x^2 + 4x + 5$.

(a) $-1 \pm 3i$ (d) $-2 \pm i$

(b) $-3 \pm i$ (e) $-1 \pm i$

(c) $-1 \pm 2i$ (f) $-2 \pm 2i$

(18) If we are given a degree 3 polynomial with real coefficients and the following zeroes: $2, 5-i$; what are the remaining zeroes?

(a) -2
(b) $5+i$
(c) -5
(d) $2+i$
(e) $-2, 5+i$
(f) $-5, -2+i$

(19) Find a polynomial with degree 3 that has the following zeroes: $2+i, -3$.

(a) x^3+7x^2-x+5
(b) x^3-4x+5
(c) $x^3-x^2-7x+15$
(d) x^3-x^2+x-1
(e) x^3+3
(f) x^3-9x^2+3x-2

(20) Consider the zeroes of x^3-64 that are complex numbers but are not real numbers. Find the sum of these numbers.

(a) -4
(b) 4
(c) 2
(d) -2
(e) i
(f) $-i$

Answer Key

(1) D	(6) E	(11) C	(16) F
(2) B	(7) F	(12) C	(17) D
(3) D	(8) A	(13) A	(18) B
(4) C	(9) D	(14) F	(19) C
(5) A	(10) B	(15) E	(20) A