

MATH 118 - EXAM 1

Fall Semester 2005 Name _____
 Instructor for Your Section _____ Meeting Times _____

NOTE: No calculator is allowed (or required) and no notecard is allowed for this exam.

Part 1: Answer the following multiple-choice questions on the Scan Sheet. Make sure to *code* your name, social security number, and form on the Scan Sheet using a pencil. Also write the name of your instructor on the Scan Sheet. (6 pts. each)

- Solve the following inequality: $|3 - 2x| > 1$
 (a) $(-\infty, 2) \cup (3, \infty)$ (b) $(-\infty, 1) \cup (2, \infty)$ (c) $(1, 2)$ (d) $(-\infty, 1)$
 (e) none of these
- Find an equation for the circle with center $(2, -5)$ and radius 3.
 (a) $(x+2) + (y-5) = 3$ (b) $x^2 - 2 + y^2 + 5 = 9$ (c) $(x-2) + (y+5) = 3$
 (d) $(x-2)^2 + (y+5)^2 = 9$ (e) $(x+2)^2 + (y-5)^2 = 9$
- Find an equation of the line passing through $(-1, 4)$ and perpendicular to the line with equation $4x + 3y = 12$.
 (a) $y = \frac{3}{4}x - \frac{19}{4}$ (b) $y = \frac{3}{4}x - 4$ (c) $y = \frac{3}{4}x + \frac{19}{4}$
 (d) $3x - 4y = 12$ (e) $4x + 3y = 8$
- Find all solutions for the equation $\frac{2}{3}(x-4) = \frac{1}{6}(x-1)$.
 (a) $x = 3$ (b) $x = 5$ (c) $x = 4$ (d) $x = 1$ or $x = 4$ (e) $x = 15$
- Find the domain of the function
$$h(t) = \frac{t}{\sqrt{2t+1}}$$

 (a) $(0, \infty)$ (b) $(-2, \infty)$ (c) $\left(-\frac{1}{2}, \infty\right)$ (d) $\left(-\infty, \frac{1}{2}\right)$ (e) none of these
- Suppose $f(x) = 2x^2$ and $g(x) = \sqrt{2x+4}$. Select the statement below that is **WRONG**, if any.
 (a) $(f \circ g)(x) = 2(2x+4)$ (b) $(g \circ f)(x) = 2\sqrt{x^2+1}$ (c) $(f+g)(x) = 2x^2 + \sqrt{2x+4}$
 (d) $(fg)(x) = 2x^2\sqrt{2x+4}$ (e) none of these is wrong

7. Determine if the function $f(x) = \frac{1}{x-1}$ is one-to-one or not. If it is one-to-one, then find f^{-1} .
- (a) one-to-one, $f^{-1}(x) = x-1$ (b) one-to-one, $f^{-1}(x) = \frac{x-1}{x}$
- (c) one-to-one, $f^{-1}(x) = \frac{1}{x+1}$ (d) one-to-one, $f^{-1}(x) = \frac{x+1}{x}$ (e) f is not one-to-one
8. Select the equation below describing the line with slope undefined passing through (4, 5).
- (a) $y = 5$ (b) $5x + 4y = 40$ (c) $5x - 4y = 0$ (d) $4x + 5y = -9$ (e) $x = 4$
9. Find the vertex and all of the intercepts for the graph of the quadratic equation $p(x) = (x+1)^2 - 4$.
- (a) vertex (1, -4); (0, 3), (3, 0), (1, 0) (b) vertex (1, 4); (0, -4), (-3, 0), (1, 0)
- (c) vertex (-1, -4); (0, -3), (-3, 0), (1, 0) (d) vertex (-1, -4); (0, 3), (3, 0), (-1, 0)
- (e) none of these is completely correct
10. Suppose $f(x) = \begin{cases} 3x+1, & x \leq 2 \\ 4x-5, & 2 < x \end{cases}$ and $g(x) = x^2$. Compute $(f \circ g)(\sqrt{2})$.
- (a) 19 (b) $(3\sqrt{2}+1)$ (c) $(3\sqrt{2}+1)^2$ (d) 7 (e) 3
11. Find the end behavior of the polynomial $g(x) = -x^4 + 5x^2 - x + 8$.
- (a) $g(x) \rightarrow -\infty$ as $x \rightarrow -\infty$, and $g(x) \rightarrow -\infty$ as $x \rightarrow \infty$
- (b) $g(x) \rightarrow -\infty$ as $x \rightarrow -\infty$, and $g(x) \rightarrow \infty$ as $x \rightarrow \infty$
- (c) $g(x) \rightarrow \infty$ as $x \rightarrow -\infty$, and $g(x) \rightarrow -\infty$ as $x \rightarrow \infty$
- (d) $g(x) \rightarrow \infty$ as $x \rightarrow -\infty$, and $g(x) \rightarrow \infty$ as $x \rightarrow \infty$
- (e) none of these
12. Use long division to find the quotient $q(x)$ and the remainder $r(x)$ so that $f(x) = q(x) d(x) + r(x)$ where $f(x) = x^4 - 5x^2 + 2$ and $d(x) = x^2 + 4x$.
- (a) $q(x) = x^6 + 4x^5 - 5x^4 - 20x^3 = 2x^2 + 8x$; $r(x) = 0$
- (b) $q(x) = x^2 - 4x + 11$; $r(x) = -44x + 2$
- (c) $q(x) = x^2 - 9x$; $r(x) = 36x + 2$
- (d) $q(x) = x^2 + 4x + 11$; $r(x) = 44x + 2$
- (e) $q(x) = x^2 - 9$; $r(x) = 38$

13. The Remainder Theorem explains how the remainder r when you divide $f(x)$ by $(x-c)$ relates to evaluating $f(c)$. Use division (either long or synthetic) and the Remainder Theorem to evaluate $f(-3)$ where $f(x) = 5x^4 - 6x^3 - 32x^2 + 7$.
- (a) 286 (b) 8 (c) -86 (d) -38 (e) none of these
14. A polynomial of degree 4 may have how many zeros and how many turning points?
- (a) at most 3 zeros and at most 3 turning points (b) at most 4 zeros and at most 3 turning point
(c) at most 4 zeros and at most 4 turning points (d) at least 1 zero and at least 1 turning point
(e) none of these

Part 2: Answer the following long questions here on the test. Show your work as much as possible to justify your steps.

15. (8 pts) Given that $-2i$ is a complex zero of the polynomial $g(x) = x^3 + 3x^2 + 4x + 12$, find all of the real and complex zeros of this polynomial and express g as a product of linear factors.

16. (8 pts) Sketch the graph for the following rational function, clearly indicating on the graph the zeros of the function, the vertical asymptotes and the horizontal asymptotes (if any).

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

Answers for the multiple choice questions above:

1b, 2d, 3c, 4b, 5c, 6e, 7d, 8e, 9c, 10d, 11a, 12b, 13a, 14b