Math 1050, Section  Midterm Exam 1  Fall 2018

Name:______________________________  uNID:____________________

Instructions:

• Please show all of your work as partial credit will be given where appropriate, and there may be no credit given for problems where there is no work shown.

• You do not need to simplify unless otherwise stated.

• No calculators or electronics of any kind (phones off).

• The exam key will be posted on Canvas by the evening of the exam.

• The exam has 100 total possible points.
1. **Function Composition:** Consider \( f(x) = \frac{1}{x^2}, \ g(x) = \sqrt{x - 2}. \)

   (a) (4 points) Write an expression for \((f \circ g)(x)\) (do not simplify).

   (b) (4 points) What is the domain of \((f \circ g)(x)\)?

2. **Function from a Graph:** Answer the following questions using the graph of the function \( f \) provided below:

   (a) (2 points) What is the **domain** of \( f \)?

      Answer:____________________

   (b) (2 points) What is the **range** of \( f \)?

      Answer:____________________

   (c) (2 points) What are the \( x\)-intercepts of \( f \) if there are any?

      Answer:____________________

   (d) (2 points) What is the \( y\)-intercept of \( f \) if there is one?

      Answer:____________________

   (e) (1 point) What is \( f(-3) \)?

      \( f(-3) = \)____________________

   (f) (1 point) For what \( x \) is \( f(x) = -2 \)?

      \( x = \)____________________
3. **Graphing Parent Functions:** Graph the following functions on their implied domains and state the implied domain and range.

(a) (5 points) \( f(x) = x^3 \)

![Graph of \( f(x) = x^3 \)]

Domain: ____________

Range: ____________

(b) (5 points) \( g(x) = \frac{1}{x} \)

![Graph of \( g(x) = \frac{1}{x} \)]

Domain: ____________

Range: ____________

4. **Graphing Transformed Functions:** Graph the following functions on their implied domains.

(a) (6 points) \( f(x) = -\sqrt{x+2} - 1 \)

![Graph of \( f(x) = -\sqrt{x+2} - 1 \)]

Domain: ____________

Range: ____________

(b) (6 points) \( g(x) = \sqrt[3]{x-1} + 1 \)

![Graph of \( g(x) = \sqrt[3]{x-1} + 1 \)]

Domain: ____________

Range: ____________
5. **Inverse Functions:**

Find inverses for the following functions if they exist (the graph is shown to the right). Indicate the appropriate reason for existence or non-existence by circling the correct statement. *If you select option C or D, do not try to invert the function.*

(a) (6 points) \( f(x) = x^3 - x \)

A) The inverse exists because it passes the vertical line test.
B) The inverse exists because it passes the horizontal line test.
C) The inverse does not exist because it fails the vertical line test.
D) The inverse does not exist because it fails the horizontal line test.

(b) (6 points) \( g(x) = \frac{2x + 5}{1 - 3x} \)

A) The inverse exists because it passes the vertical line test.
B) The inverse exists because it passes the horizontal line test.
C) The inverse does not exist because it fails the vertical line test.
D) The inverse does not exist because it fails the horizontal line test.
6. **Graphing Polynomials:**

(a) (10 points) Graph \( p(x) = x^2 - 2x - 1 \) and give the information requested on the right.

- **x-intercept(s):** 
- **y-intercept:** 
- **Range:** 
- **Increasing Interval:** 
- **Decreasing Interval:**

(b) (10 points) Sketch the graph of \( p(x) = -2x(x + 4)^2(x - 2)(x - 4) \) and give the information requested on the right.

- **x-intercept(s):** 
- **y-intercept:** 
- **Leading term:**

\( x \) for which \( f(x) > 0: \)
7. **Complex Numbers:** Let $A = 1 + 2i$ and $B = 3 - 4i$. Compute the following and write the answer as $a + bi$ with $a, b \in \mathbb{R}$.

(a) (2 points) $A + B =$

(b) (2 points) $A - B =$

(c) (2 points) $A \cdot B =$

(d) (2 points) Complex conjugate $\overline{B} =$

8. (10 points) **Find All Roots:** Find all roots (real and complex), $x$-intercepts, $y$-intercepts of the polynomial $p(x) = x^3 - 3x^2 + 6x - 4$ given that $p(1) = 0$. Then state the interval(s) on which $p(x) > 0$.

All roots (*real and complex*):

$y$-intercept:

$x$-intercepts:

$x$ for which $p(x) > 0$: 
9. (10 points) *Polynomial Inequality:* Solve for the set of $x$ such that $x^2 + 2x \leq 3x + 12$. Write your answer in interval notation.