Review for Final Exam

Chapters 2 and 3

Math 1051 - Precalculus I
Solve:

\[
(x^3 - 9x) |x - 1| = 0
\]

Ans:
\[x = 0, 3, -3, 1\]
Solve:

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Ans: \(x = 0, 3, -3, 1\)
Final Exam
Friday, Dec 14
1:30pm - 4:30pm
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Locations
DIS 21, 23: Mechanical Engineering, Room 18
DIS 22, 27: Mechanical Engineering, Room 108
DIS 24: Mechanical Engineering, Room 212
DIS 26: Mechanical Engineering, Room 102

Exam Format
14 Multiple Choice, 5 "Essay" questions

Be sure to bring your student ID, pencils, and a scientific calculator

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2.1 Functions

- Relations versus functions
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- Value of a function
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- Implicit form of a function (e.g. $x = 2y$)
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- Domain
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- Relations versus functions
- Value of a function
- Implicit form of a function (e.g. $x = 2y$)
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- Sums, differences, products, and quotients of functions
2.1 Functions

- Relations versus functions
- Value of a function
- Implicit form of a function (e.g. $x = 2y$)
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- Sums, differences, products, and quotients of functions

Consider the function $f(x) = \sqrt{3x - 9} - x^2 - 4x - 5 + \log(x - 4)$. To find the domain, we need to ensure that the arguments of the square root, logarithm, and polynomial terms are non-negative and defined. The square root requires $3x - 9 \geq 0$, which simplifies to $x \geq 3$. The logarithm requires $x - 4 > 0$, which simplifies to $x > 4$. The polynomial terms are defined for all real numbers. Therefore, the domain of $f(x)$ is $x > 4$. 

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2.1 Functions

- Relations versus functions
- Value of a function
- Implicit form of a function (e.g. $x = 2y$)
- Domain
- Sums, differences, products, and quotients of functions

Find domain of

$$f(x) = \frac{\sqrt{3x - 9}}{x^2 - 4x - 5} + \log(x - 4)$$
2.2 Graphs

- Identify the graph of a function
2.2 Graphs

- Identify the graph of a function
- Extract information from graphs
2.3 Properties of Functions

- **Even functions** \( f(-x) = f(x) \)

- **Odd functions** \( f(-x) = -f(x) \)

Symmetric about the **y-axis** (like \( f(x) = x^2 \))

Symmetric about the origin (like \( f(x) = x^3 \))

**Even, odd, or neither?**

\[ f(x) = 2x^4 - 3x^2 + 1 \]
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Even, odd, or neither?

$$f(x) = \frac{2x^4 - 3x^2 + 1}{3x}$$
Average rate of change

\[ ARC = \frac{f(b) - f(a)}{b - a} \]

Find ARC of \( f(x) = x^2 - 2x + 3 \) from \(-2\) to 1

Find equation of secant line for \( f(x) = x^2 - 2x + 3 \) between \(-2\) and 1
Average rate of change

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2.4 Library of Functions

- Square root, cube root
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- Absolute value
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- Reciprocal (1/x)
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- Greatest integer or “step” function
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Graph

\[
f(x) = \begin{cases} 
3x + 1 & -3 < x < 1 \\
4 & 1 \leq x < 3 \\
(x - 4)^2 - 2 & x \geq 4 
\end{cases}
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3x + 1 & -3 < x < 1 \\
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(x - 4)^2 - 2 & x \geq 4 
\end{cases} \]
2.5 Graphing Techniques

- Vertical shifts
- Horizontal shifts
- Compressions
- Stretches
- Reflections

\[ f(x) = -\sqrt{4 - x} + 3 \] using transformations

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RCS = Reflections, then Compressions, then Shifts
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- Vertical shifts
- Horizontal shifts
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RCS = Reflections, then Compressions, then Shifts

Graph $f(x) = -\sqrt{4 - x} + 3$ using transformations
An equilateral triangle is inscribed in a circle of radius $r$. Express the circumference $C$ of the circle as a function of the length $x$ of the side of the triangle.
3.1 Linear Functions

- Graphs

Write an expression for the cost $C$ of producing $x$ bicycles in a day if $C$ is a linear function of $x$. Each bicycle costs $50 to produce, and the fixed costs for the factory are $1200 per day.
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- Graphs
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- Increasing, Decreasing, Constant

Applications (word problems)

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Graphs

ARC

Increasing, Decreasing, Constant

Applications (word problems)
Graphs
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- Standard form: \( f(x) = ax^2 + bx + c \)
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- Vertex

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x_{\text{vertex}} = \frac{-b}{2a}, \quad y_{\text{vertex}} = f(x_{\text{vertex}})
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Find the vertex of $f(x) = 2x^2 - 4x - 5$
A cylindrical silo is made with a flat circular top and sides using 2000 square feet of metal. Express the volume $V$ of the silo as a function of the radius $r$. 
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We will do these next time