Math 0031 **Sample Exam 2**

Spring 2017 **Name:** _____

No calculators, no notes, no books are permitted.

SHOW ALL WORK (no work = no credit). Write neatly. Simplify your answers when possible.

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1. Find a polynomial function $f(x)$ of lowest degree with rational coefficients that has the numbers $1+i$ and $\sqrt{3}$ as its zeros.

2. Consider the function $f(x) = \dfrac{x^3 + x^2 - 2x}{x^2 - 1}$.

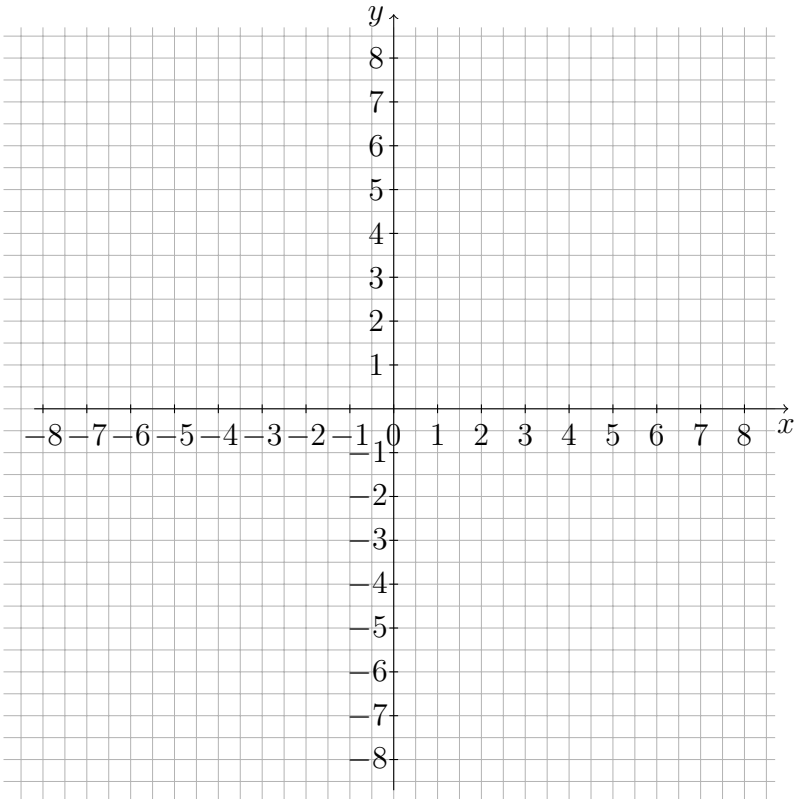
(a) Determine the domain of the function.

(b) Determine the vertical asymptotes of the graph of the function, if any.

(c) Determine the horizontal asymptotes of the graph of the function, if any.

(d) Determine the oblique asymptotes of the graph of the function, if any.

(e) Sketch the graph of the function $f(x)$. Draw all asymptotes. Mark the asymptotes and points outside the domain, if any.



3. Solve the inequality $\dfrac{x-4}{x+3} \leq \dfrac{x+2}{x-1}$.

4. Using the definition of one-to-one function show that $h(x) = x^4+2x^2-5$ is not one-to-one function.

5. The function $f(x) = \dfrac{x-1}{x+2}, \quad x > -2$ is one-to-one. Find its inverse when $f(x) < 1$.

6. Find

   (a) $\log_3 \frac{1}{27}$

   (b) $\log_{64} 4$

   (c) $\log \sqrt{100,000}$

   (d) $\dfrac{\log_5 81}{\log_5 3}$

7. Simplify

(a) $\log_5(\frac{1}{25} \cdot \frac{1}{125})$

(b) $\log t^3 + \log \dfrac{x}{t\sqrt{t}}$

(c) $4 \ln x^{3/2} + 5 \ln \sqrt[5]{y^2}$

8. Solve equations

(a) $3^{2x-8} = 9^{2-x}$

(b) $\ln(2x - x^2) = 0$

(c) $\log_3(x + 6) - \log_3(x + 2) = \log_3 x$

9. A country's population doubled in 40 years. What is the exponential growth rate? Leave your answer in exact form.