

Review Test #2
Sections 3.5, 3.6, Chapter 4 (4.1 – 4.6), and Chapter 5 (5.2, 5.6, 5.7)

To prepare for the test, you may study:

- All examples and exercises done in class
- Quiz #2
- Handout Section 3.5 – Graphs of Rational Functions - all exercises (see website for handout and solutions)
- Handout Sections 4.3 - 4.6 – all exercises (see website for handout and solutions)
- Handout 5.2 – 5.7
- All homework problems from the listed sections.

More practice

Section 3.5

1) Let $g(x) = \frac{1}{x+1}$

- a) Sketch a graph of the function (using transformations or by finding asymptotes and plotting points).
- b) What are the asymptotes for the graph?
- c) State its domain and range.
- d) Find the intercepts.
- e) Calculate $g(-2)$.
- f) Solve $g(x) = -2$.
- g) Find points that correspond to parts (d) and (e) on the graph of the function.

2) Graph each function . Show all work.

a) $g(x) = \frac{3x^3 - 3x^2 - 6x}{x^3 + 8x^2 + 16x}$

b) $h(x) = \frac{x^3 - 2x^2 - 13x - 10}{24x^3 + 40x^2 - 2x - 12}$

Chapter 4

4) Let $f(x) = 1 + 2\ln(x-1)$.

- a) Graph the function.
- b) State the domain, range, and vertical asymptote.
- c) Find the exact x - and y -intercepts (if any).
- d) Does the function have an inverse? Explain. Find $f^{-1}(x)$.
- e) Graph the inverse $f^{-1}(x)$ showing the symmetry through $y = x$.
- f) State the domain, range, and horizontal asymptote for the inverse function $f^{-1}(x)$.
- g) Find the exact x - and y -intercepts of the inverse function $f^{-1}(x)$ (if any).

5) Let $f(x) = 3 - 2^{x+1}$.

- a) Graph the function.
- b) State the domain, range, and horizontal asymptote.
- c) Find the exact x - and y -intercepts (if any).

- d) Does the function have an inverse? Explain. Find the inverse function $f^{-1}(x)$.
 e) Graph the inverse function showing how it can be obtained from the graph of f .
 f) Find the exact x - and y -intercepts for $f^{-1}(x)$ (if any).

6) Find the domain of each function:

a) $f(x) = \log(15 - 4x)$ b) $g(x) = \ln(x^2 - 25)$ c) $h(x) = \log_2 \frac{3-4x}{x+2}$

(Answers: a) $x \in \left(-\infty, \frac{15}{4}\right)$; b) $x \in (-\infty, -5) \cup (5, \infty)$; c) $x \in \left(-2, \frac{3}{4}\right)$

- 7) a) Graph $f(x) = -\log_3(x+2) + 1$ using transformations. Find domain, range, asymptote, exact intercepts.
 b) Find the inverse of the function, as well as its domain and range. Graph the inverse function showing how it can be obtained from the graph of f . Find the exact intercepts for the inverse function (if any).

- 8) Graph $\begin{cases} 2^x, & x < 1 \\ 0, & x = 1 \\ 1 - \frac{1}{2}x, & x > 1 \end{cases}$. Find domain, range, intercepts, asymptotes, and the intervals on which the function increases or decreases.

- 9) At 12 noon, a bacteria colony was growing exponentially. The population was 12,000 at 3 pm, and 15,000 at 5 pm. What was the population at 12 noon?

10) Solve the following equations for x :

a) $1.7(2.1)^{3x} = 2(4.5)^x$ b) $\log x + \log(x-1) = \log 2$ c) $3^{4\log x} = 5$ d) $11 \cdot 3^x = 5 \cdot 7^x$

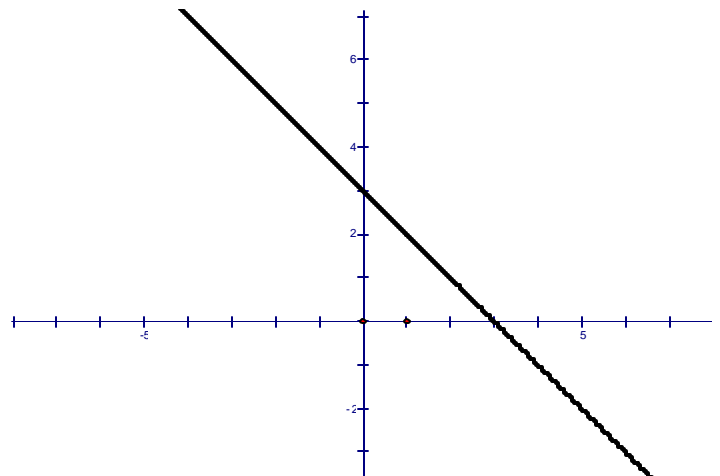
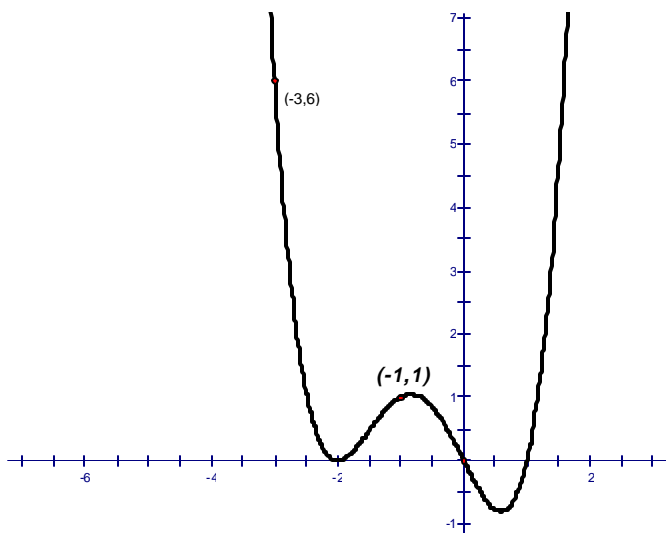
- 11) If you need \$25,000 six years from now, what is the minimum amount of money you need to deposit into a bank account that pays 5% annual interest, compounded: a) annually; b) monthly; c) continuously.

(Answers: a) 18,655.38; b) 18,532.00)

- 12) Let $p(x) = 2x + 1$ and $q(x) = x^2 - 3$. Find $(p \circ q)(x)$.

- 13) Let u and v be two functions defined by the graphs below (u is the curve, v is the line). Find:

a) $(v \circ u)(-1)$ b) $(u \circ v)(5)$ (Answers: 2, 0).



14) Let $f(x) = x^2 + 1$, $g(x) = \frac{1}{x-3}$, $h(x) = \sqrt{x}$. Find and simplify:

a) $(f \circ g)(x)$; b) $(g \circ f)(x)$ c) $(g \circ g)(x)$

15) Suppose $f(x)$ is an invertible function and that both f and f^{-1} are defined for all values of x . Suppose also that $f(2) = 3$ and $f^{-1}(5) = 4$. Evaluate each of the following expressions, or, if the given information is insufficient, write *unknown*.

a) $f^{-1}(3)$ b) $f^{-1}(4)$ c) $f(4)$ d) $f(f^{-1}(2))$.

16) Find the inverse of each function:

a) $f(x) = 2\sqrt[3]{x-4}$ b) $g(x) = \frac{1}{1+\frac{1}{x}}$ c) $f(x) = \frac{2x+1}{3x-2}$ d) $f(x) = \sqrt{1+\sqrt{x}}$

e) $h(x) = \frac{3 \cdot 2^x + 1}{3 \cdot 2^x + 3}$ f) $l(x) = \log\left(\frac{x+5}{x-4}\right)$ g) $h(x) = \frac{\sqrt{x}}{\sqrt{x+1}}$

(Answers: a) $\frac{x^3}{8} + 4$; b) $\frac{x}{1-x}$; c) same; d) $(x^2 - 1)^2$; e) $\log_2\left(\frac{1-3x}{3x-3}\right)$; f) $\frac{5+4 \cdot 10^x}{10^x - 1}$; g) $\frac{x^2}{(1-x)^2}$)

Chapter 5

17) Textbook, Section 5.6 – Exercises # 42, 43, 53 – 58

18) Graph the solution set of the system of inequalities:

$$\begin{cases} x \geq -3 \\ y < 1 + 2^{x+1} \\ y > \log_3 x \end{cases}$$

19) Solve the following systems using Gaussian Elimination:

a)
$$\begin{cases} x + y + z + w = 0 \\ x + y + 2z + 2w = 0 \\ 2x + 2y + 3z + 4w = 1 \\ 2x + 3y + 4z + 5w = 2 \end{cases}$$

b)
$$\begin{cases} x + z + 2w = 6 \\ y - 2z = -3 \\ x + 2y - z = -2 \\ 2x + y + 3z - 2w = 0 \end{cases}$$

c)
$$\begin{cases} 2x - 3y - z = 13 \\ -x + 2y - 5z = 6 \\ 5x - y - z = 49 \end{cases}$$

(Answers: a) $(-1, 1, -1, 1)$; b) $(1, -1, 1, 2)$; c) $(10, 3, -2)$)