REVIEW TEST 3 - Chapters 8 and 9

To prepare for the test, you may study the following:

- Quiz #5, Quiz #6
- Handout: 8.1 & 8.2 Quadratic Equations and Their Applications - all exercises and applications except applications 3, 5, and 6 on page 2 (see website for handout)
- Handout: 8.3 Quadratic Functions and Their Graphs –all exercises and applic ations (see website for handout)
- Handout: Sections 9.1 Exponential Functions; Exponential Growth and Decay – all exercises and applications except example 2 (page 4) and exercises 2 (page 9)
- Homework #5, #6

More practice

Chapter 8

Solve (in $\mathbb{C}$) by extracting roots:

1) $9x^2 = 25$; **2)** $\frac{2x^2}{3} = 4$; **3)** $\left(x - \frac{1}{2}\right)^2 = \frac{3}{4}$;

4) $3(t-2)^2 + 38 = 0$ **5)** $4(x+2)^2 = 12$ **6)** $1 - 3(y-1)^2 = 10$

Solve the following (in $\mathbb{C}$) by completing the square:

7) $x^2 - 6x - 7 = 0$; **8)** $2a^2 - 6a - 5 = 0$; **9)** $-4x^2 - 36x - 65 = 0$; **10)** $3x^2 = 5x + 21$

Solve the **f**ollowing (in $\mathbb{C}$) by the quadratic formula:

11) $2x^2 + 1 = 4x$; **12)** $t^2 - \frac{t}{2} + 1 = 0$; **13)** $\frac{1}{2}x^2 + 1 = \frac{3}{2}x$;

14) Write a quadratic equation with rational coefficients that has: a) $1 - \sqrt{2}$ as a solution; b) -2 and 3 as solutions;

c)Write (in standard form) a quadratic equation with real coefficients that has 1-2i as a solution.

d) Write a quadratic equation in standard form with integer coefficients that has the solutions of $\frac{2}{7}, -\frac{4}{3}$.

15) Solve each equation for the indicated variable:

a) $3x^2 + xy + y^2 = 2$ solve for y in terms of x; b) $A = 2w^2 + 4lw$ solve for w in terms of A and l;

c) $a^2 + b^2 = c^2$ solve for b in terms of a and c; d) $h = -16t^2 + \frac{23}{3}t$ solve for t in terms of h.

16) Show in two different ways that 3-2i is a solution of $x^2 - 6x + 13 = 0$.

17) Solve the following equations: a) $x^4 - 3x^2 = -2$; b) $x^{\frac{2}{3}} - 2x^{\frac{1}{3}} - 3 = 0$; c) $x + \sqrt{x} - 6 = 0$;

18) Answer all questions; show all work. Let $y = \frac{1}{3}(x+3)^2 - 2$ be a parabola.

a) What type of curve is this?; b) y-intercept?; c) Vertex ; d) x- intercept(s)? ; e) sketch its graph; f) What is the standard form of the equation? g) Domain? h) Range? i) Is this function one-to-one? Does it have an inverse?

19) Answer all questions for each parabola.

i) $y = -2x^2 + x + 3$ ii) $y = -10x^2 - 2x + 1$ iii) $y = \frac{1}{7}x^2 - 8x + 66$

a) What type of curve is this?; b) y-intercept?; c) Vertex ; d) x- intercept(s)? ; e) sketch its graph; f)What is the vertex form of the above equation? g) Domain? h) Range? i) Is this function one-to-one? Does it have an inverse?

20) Let $f(x)=2\left(x+\frac{1}{3}\right)^2-\frac{4}{9}$. Find the following and simplify (don't give approximate answers) :

a) The domain of f(x); b) f(2); c) Find values of "x" where f(x)=2 d) The range of f(x).

21) Harold has 300 meters of fencing and he wants to enclose three rectangular grazing areas along a river. He will not fence the river side.

a) Write and equation for the area "*A*" in terms of the width of one of its sides "*x*" (see figure)

b) What would the dimensions be of the outer pen if the total area was 4,400 square feet?

22) A model rocket launched with an upward velocity of 3.75 meters per second. The height of the rocket after *t* seconds if given by the formula: $h=-4.9t^2+3.75t+12.25$.

a) How high is the rocket off the ground to start with?

b) How long does it take the rocket to hit the ground?

c) When does the rocket reach a height of 16 meters?

d) During what time intervals is the rocket at a height greater than 15 feet?

23) A baseball thrown vertically reaches a height *h* in feet given by $h=56t-16t^2$, where *t* is measured in seconds. During what intervals is the height of the ball greater than 40 feet?

24) Solve the following inequalities. Write the solution set in interval notation:

a) $x^2-6x-7\le 0$; b) $6x-x^2\ge 7$; c) $x(2-3x)(x-3)\ge 0$; d) $\frac{3}{x+3}>\frac{5}{x-2}$;

e) $-x(x+1)^2(x^2+5x+6)(2x^2+3x+10)>0$

CHAPTER 9 – Exponential and Logarithmic Functions

1) Find the domain of each function:

a) $f(x)=\log_{10}(12-4x)$; b) $g(x)=\ln(x^2-25)$; c) $h(x)=\log\left(\frac{3-4x}{x+2}\right)$

2) Simplify:

a) $\log_2(\log_4 16)$ b) $\log_{10}(\log_3(\log_5 125))$ c) $2^{\log_2 5}-3\log_5\sqrt[3]{5}$

3) If the size of a bacteria colony doubles in 5 hours, how long will it take for the number of bacteria to triple?

4) Suppose a certain radioactive substance has a half-life of 5 years. An object starts with 20 kg of the radioactive material.

a) How much of the radioactive material is left after 10 years?

b) The object can be moved safely when the quantity of the radioactive material is 0.1 kg or less. How much time must pass before the object can be moved?

5) The number of bacteria present in a culture after t hours is given by the formula $N=1000e^{0.69t}$.

a) How many bacteria will be there after ½ hour? b) How long will it be before there are 1,000,000 bacteria?

c) What is the doubling time?

6) Find the exact (if any) *x*- and *y*-intercepts of the graphs of the following functions:

a) $f(x)=2^x-3$ b) $g(x)=2\cdot 5^x-1$ c) $h(x)=\log_2(x+1)+5$ d) $l(x)=1-\ln(2x)$

7) Solve the following equations:

a) $e^{1-2x}=20$ b) $5^{x}=17$ c) $\log_3(x-5)+\log_3(x+3)=2$ d) $\log_3(x-1)=2$

e) $\log_5 x=4\log_5 2-\log_5 8$ f) $10^{x+3}=5e^{7-x}$ g) $2e^{3x}=4e^{5x}$ h) $2x-1=e^{\ln x^2}$

i) $5^{x}=3^{2x-1}$ j) $\log_8(x+5)-\log_8 2=1$ k) $\log_2(\log_3 x)=-1$

8) Let $f(x)=1-2x$ and $g(x)=\dfrac{2-x}{x+3}$. Answer the following questions:

a) Find $(g\circ f)(x)$. b) $(f\circ g)(2)$ c) Find $f^{-1}(x)$. d) Find $g^{-1}(x)$.

9) Simplify the following expressions.

a) $4\ln x+7\ln y-3\ln z$ b) $\dfrac{1}{2}(\log_5 x+\log_5 y)-2\log_5(x+1)$

c) $\log_3 405-\log_3 5+\log 5+\log 2$ d) $\log_4(\log_2 16)$

10) Graph $f(x)=3^{x}$ and $f^{-1}(x)=\log_3 x$ on the same coordinate system showing the symmetry about the bisector line $y=x$. Label the axes and all the points.

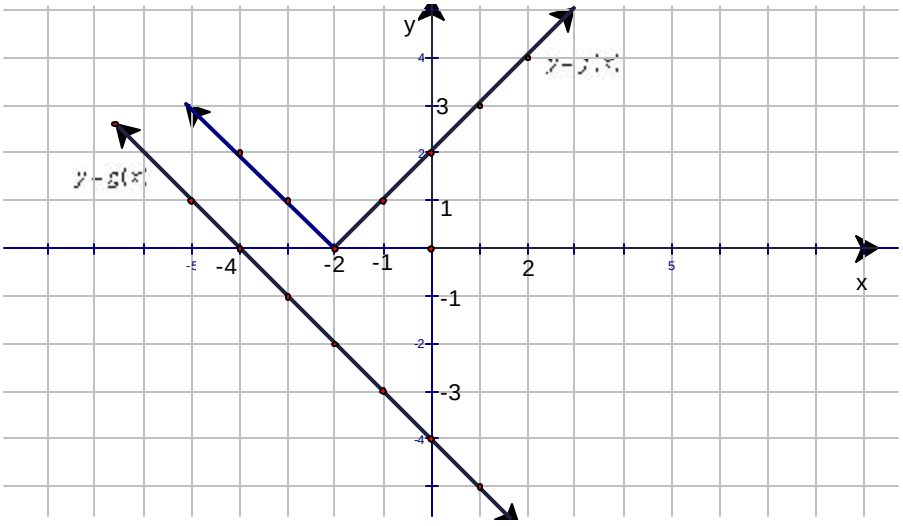
11) Graph the function $f(x)=4^{x}$. Label the axes and show clearly how you graph (label all the points you use). Answer the following questions:

a) What is the domain of f? b) What is the range of f? c) What is the y-intercept?
d) What is the x-intercept (if any)? e) Does the graph have an asymptote? What kind? What is its equation?
f) If this function one-to –one? Explain. g) Does f have an inverse? Why?
h) What is the inverse function (Do not prove). i) Show on the above coordinate system how you obtain the graph of f^{-1} from the graph of f. That is, sketch the graph of f^{-1} showing the symmetry about the line $y=x$.

12) Using the formulas for compound interest $A=P\left(1+\dfrac{r}{n}\right)^{nt}$ or $A=Pe^{rt}$, solve the following problem.

Find the accumulated value of an investment of \$10,000 for 5 years at an interest rate of 5.25% if the money is:
a) compounded monthly b) compounded continuously.
c) If \$10,000 are deposited in an investment account that pays an interest rate of 5% compounded continuously, how many years is it going to take for the accumulated value to be \$15,000?

13) Use the graphs of f and g to evaluate each composite function.



a) $(f\circ g)(-1)$

b) $(g\circ f)(0)$