

**MAT120, MAT122 Final Exam Review**  
**Fall 2005**

The final exam for MAT120 and MAT122 will consist of 30 multiple choice questions and 5 open-ended questions. The exam itself will cover six categories: General function understanding, linear functions, quadratic functions, exponential functions, logarithmic functions, and rational and radical functions. Sample questions for each topic are given below and are not to be considered identical to those found on the exam.

**A. General function understanding,**

- *find function values (input and output) using graphs, tables, or algebra*

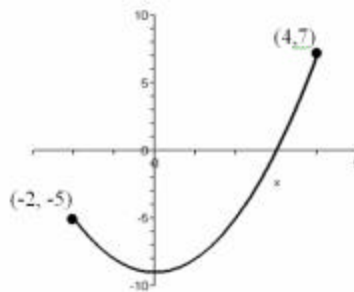
- A1. a) Given  $f(x) = 2x^2 - 15$  find  $f(10)$ , and find  $f(-10)$ .  
 b) Given  $f(x) = 2x^2 - 15$ , find  $x$ , such that  $f(x) = 3$ .  
 c) Using the table in question A4, find  $k(3)$ .  
 d) Using the table in question A4, find  $x$  such that  $k(x)=38$ .  
 e) Using the graph in A3, find  $f(0)$ .  
 f) Using the graph in A3, find  $x$  such that  $f(x)=0$ .

- *find the output of a composition of functions using graphs, tables or algebra*

- A2. Given  $f(x) = 2x^2 - 15$  and  $g(x) = \frac{x-5}{2}$  find  $f(g(13))$ .

- *determine domain and range of a function using graphs, tables, or algebra*

- A3. Determine the domain and range of  $f$ :



- *generate a 'stat plot' on your calculator using given data*

- *generate a regression function on your calculator using given data*

- A4. Identify each type of function:

$x$	1	2	3	4	5
$f(x)$	20	30	45	67.5	101.25
$g(x)$	50	40	32	25.6	20.48
$h(x)$	0	15.05	23.86	30.10	35
$k(x)$	30	38	46	54	62
$j(x)$	16	18	15	10	0

- find the average rate of change between two points on a function.

A5. Find the average rate of change between  $h(2)$  and  $h(4)$  in A4.

- work with rules of exponents – give all exponents as positive values.

A6. Simplify: a)  $x^2x^7$

b)  $(x^2)^7$

c)  $x^{\frac{2}{3}}x^{\frac{1}{5}}$

d)  $\frac{a^2b^4}{a^5b^2}$

- find the inverse of a function and interpret the meaning in real-world terms

A7. If  $f(x) = 150 + 700x$  find  $f^{-1}(x)$ .

A8. If  $f(x)$  is a function that gives total cost of renting an apartment through the first  $x$  months of a year, what does  $f^{-1}(4350) = 6$  mean?

## **B. Linear functions:**

- identify a linear function based on analysis of constant rate of change

B1. In problem A4, which function(s) is/are linear? How can you justify your response?

- solve linear equations for a specified variable

B2. Solve  $y = \frac{2}{3}x + 5$  for  $x$ .

- simplify linear expressions

B3. Simplify  $2(x+3) - 5(2x-7)$

- find the y-intercept and slope of a linear relationship

B4. Find the slope and y-intercept of  $5x + 3y = 21$

- find a linear function given two points on the function

B5. Give, in  $y=mx+b$  form, the equation of the line passing through  $(-3, 2)$  and  $(5, 7)$

- find a linear function given a point and a slope

B6. Give, in  $y=mx+b$  form, the equation of the line passing through  $(-3, 2)$  with a slope of  $-3$ .

- find the intersection of two linear functions and interpret the meaning

B7. Solve  $f(x) = g(x)$  given  $f(x) = 2x - 7$  and  $g(x) = 5x + 5$

B8. Use your graphing calculator to find when the population will reach 20,000 given that population as a function of time ( $t$ , in years since 2000) is given by  $P(t) = 32375 - 4500t$

- *interpret meaning of an answer in real-world terms*

B9. What does  $P(3.5) = 16625$  mean with  $P(t)$  given in question B9?

### C. Quadratic functions:

- *identify a quadratic function*

C1. In the table for A4, which function(s) is/are quadratic? How can you support your answer?

- *solve quadratic equations by graphing, the quadratic formula, and factoring*

C2. Solve  $2x^2 - 7x = 15$  for  $x$  by factoring, graphing and the quadratic formula.

C3. Solve  $8x^2 + 6x + 2 = 0$  for  $x$  using the quadratic formula. Simplify your answer.

- *perform the indicated operations and simplify the quadratic expressions*

C4. Simplify: a)  $-2(x^2 - 2x + 5) - 3(x^2 + 2x - 7)$

b)  $(2x - 3)(3x + 7)$

- *find the y-intercept (vertical intercept) of a quadratic function*

C5. What is the y-intercept (vertical intercept) of  $f(x) = 2x^2 - 7x - 15$ ?

- *interpret meaning of an answer in real-world terms*

C6. If  $h(t) = -16t^2 + 40t + 80$  represents the height of a ball (above the ground) thrown from a roof as a function of time (in seconds), what does  $h(2) = 96$  mean?

C7. When will  $h(t) = 24$ ? What will that mean?

C8. When will the ball hit the ground? How did you find the answer?

- *find the vertex and zeros of a parabola and interpret the meaning in context*

C9. Find the vertex of  $h(t)$ . What is the meaning of this in the context of question C6?

- *perform operations on complex numbers (including solutions to quadratic equations)*

C10. Simplify: a)  $3i(5 - 2i)$

b)  $(3 + i) - (2 - 3i)$

c)  $(3 + i)(2 - 3i)$

### D. Exponential functions:

- identify an exponential function

D1. In the table for A4, which function(s) is/are exponential? How can you support your answer?

- solve exponential equations by graphing or using algebra. Round to the nearest 0.001.

D2. Solve for  $x$ : a)  $4^x = 1250$  b)  $2(9)^{x+2} = 36$

- find the y-intercept (vertical intercept) of an exponential function

D3. What is the meaning of  $a$  and  $b$  in  $f(x) = a \bullet b^x$

D4. What is the y-intercept of  $f(x) = 300(1.15)^x$  where  $f(x)$  is the population of a city  $x$  years since 2000. What does it mean?

- apply meaning to the base of an exponential function.

D5. What does the 1.15 mean in question D4? What is the growth rate as a percentage?

- find the inverse of an exponential function

D6. Find  $f^{-1}(x)$  for the function in D4.

### E. Logarithmic functions:

- identify an logarithmic function

E1. In the table for A4, which function(s) is/are logarithmic? How can you support your answer?

- solve logarithmic equations by graphing or using algebra

E2. Solve  $3 + \log(120 - x) = 5$  for  $x$ .

- simplify logarithmic expressions

E3. Write the following as a sum, difference or multiple of logarithms

$$\log \frac{xy^4}{\sqrt{z}}$$

E4. Rewrite the following as the logarithm of a single quantity.

$$\log(x+2) - 3 \log y + 2 \log z$$

E5. True or False?

\_\_\_\_\_ a)  $\log(a+b) = \log(a) + \log(b)$

\_\_\_\_\_ b)  $\log(a+b) = \log(a) \bullet \log(b)$

\_\_\_\_\_ c)  $\log(a \bullet b) = \log(a) + \log(b)$

\_\_\_\_\_ d)  $\log(a-b) = \frac{\log(a)}{\log(b)}$

- determine the domain and range of a logarithmic function

E6. What is the domain and range of:

a)  $f(x) = \ln(x)$

b)  $f(x) = \log(x-1)$

- convert equations between logarithmic and exponential forms

E7. Convert  $4^x = 1250$  into logarithm form.

- apply the change of base formula

E8. Find  $\log_5 640$

### F. Rational and radical functions:

- solve rational and radical equations by graphing or using algebra

F1. Solve  $\frac{5}{9} = \frac{8}{x+1}$  for  $x$ .

F2. Solve  $4x = 7 + \frac{2}{x-1}$  for  $x$ .

F3. Solve  $\sqrt{2x+1} + 3 = 5$  for  $x$ .

- simplify rational and radical expressions

F4. Simplify  $\frac{x^2 + 5x}{x^2 + 4}$

F5. Simplify  $\sqrt{32x^3}$

- determine vertical asymptotes of rational functions

F6. Given  $f(x) = \frac{3x}{5-x}$ :

- Draw the complete graph of this function.
- What is the trend? How does the graph demonstrate this trend?
- Write the equation of the vertical asymptote.
- What is the input that results in an output value of 9?

F7. Determine the vertical asymptote(s) of  $y = \frac{3x-10}{x^2+x-20}$