MATH 100
Test #3

Name____________________________
Fall 2007

No calculators are allowed when taking Part I of this test. You may do scratch work at the bottom of this page or on the back of the page. You should take no more than about 10-15 minutes on Part I. When you finish Part I, turn it in and begin on Part II. You may use your calculator on Part II.

Part I. (2 points each)

For items 1-5 match each function with the most appropriate sketch of a graph.

Most Appropriate Graph

1. $y = 10x^{1.7}$ __d__

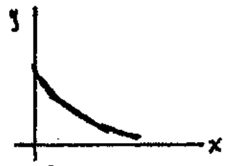
2. $y = 10(0.8)^x$ __a__

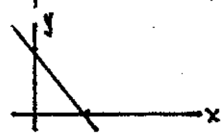
3. $y = \dfrac{10}{x+2}$ __a__

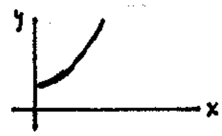
4. $y = 10x^{0.4}$ __e__

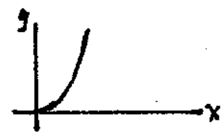
5. $y = 10(1.4)^x$ __c__

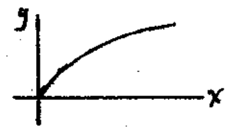
6. $y = -2x + 10$ __b__

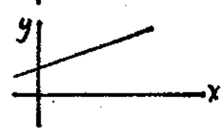
a. 

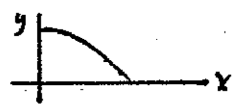
b. 

c. 

d. 

e. 

f. 

g. 

For items 7-10 write your answer on the line in the answer column.

7. Simplify: $\sqrt{36x^{36}}$ 7. $6x^{18}$

8. Simplify: $\left(8x^9\right)^{\frac{2}{3}}$ 8. $4x^{6}$

9. Solve for x: $20 = \dfrac{2(x-1)}{4} + 18$ 9. 5

10. Solve for x: $54 = 2x^{\frac{3}{2}}$ 10. 9

Name____________________________________

Part II (5 points each). In each case, either explain how you solved the problem or show your work in the space provided.

11. The population of a country is now 10 million and is growing at a continuously compounding rate of 4% per year.

   a. Assume that the country's population will continue to grow at the present rate and write a rule for a function that will give the country's population as a function of time in years from the present.

   Let $P(t)$ = population (millions) t years from now

   $P(t) = 10e^{0.04t}$

   b. Show how to use your function to estimate the country's population in five years. Be sure to state your conclusion.

   $P(5) = 10e^{(0.04)(5)} \approx 12.21$

   The country's population in 5 years will be about 12.21 million.

   c. In how many years will the country's population have doubled and reached 20 million?

   $20 = 10e^{0.04t}$

   $2 = e^{0.04t}$

   $2 \approx (1.0408)^t$

   $\ln 2 \approx t \ln(1.0408)$

   $0.693 \approx 0.04t \implies t \approx 17.3$

   The country's population will double in about 17.3 years.

12. Solve for x expressing your answer to the nearest 0.1: $200 = 20x^{0.8}$

$200 = 20x^{0.8}$

$10 = x^{0.8}$

$(10)^{\frac{10}{8}} = \left(x^{\frac{8}{10}}\right)^{\frac{10}{8}}$

$17.78 \approx x$

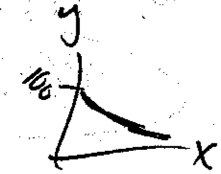
So, $x \approx 17.8$

For items 13 and 14 specify the type of function that will best fit the data (linear, exponential, power, or revised inverse) and specify a rule for the particular function you think best fits the data. In each case calculate the first differences and the ratios of successive terms and explain how you determined the type of function you specified. Describe the shape of the graph and determine the value of y when x = 10.

13.

x	y	Δy	Ratio
0	100		
1	80	-20	0.8
2	64	-16	0.8
3	51.2	-12.8	0.8
4	40.96	-10.24	0.8

Since the ratios are constant, the function is exponential



$y = 100(0.8)^x$

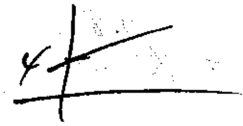
The graph is decreasing and concave up.

If $x = 10$, $y \approx 10.7$

14.

x	y	Δy	Ratio
0	4		
1	6.5	2.5	1.625
2	9	2.5	1.385
3	11.5	2.5	1.278
4	14	2.5	1.217

The function is linear
The graph is a line that is increasing at a constant rate



$y = 2.5x + 4$

If $x = 10$, $y = 29$.