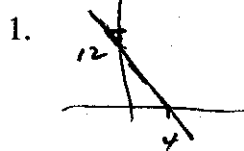MATH 100   Name_____
Test #3   Fall 2008

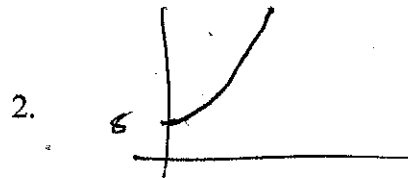Calculators are allowed for both parts of this test. No notes are allowed.

For items 1-6 make a rough sketch of an appropriate graph showing approximate intercepts, proper concavity, and appropriate increasing or decreasing behavior. (2 points each)
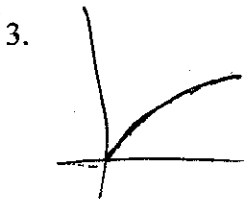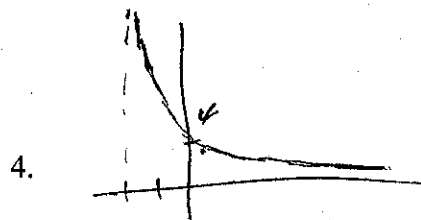
Appropriate Graph

1. $y = -3x + 12$ 1.
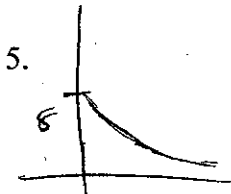
2. $y = 8(1.25)^x$ 2.

3. $y = 8x^{0.75}$ 3.

4. $y = \dfrac{8}{x+2}$ 4.

5. $y = 8(0.67)^x$ 5.

6. $y = 8x^{2.03}$ 6.
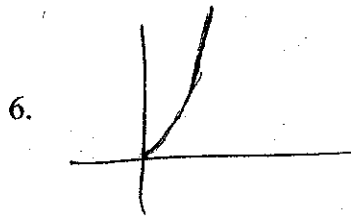
For items 7-10 write your answer on the line in the answer column. Express any approximate answers to the nearest 0.01. (3 points each)

7. Simplify: $\sqrt{100x^{100}}$ 7. $\underline{10X^{50}}$

8. Solve for x: $10 = 20e^{-0.12x}$ 8. $\underline{X \approx 5.8}$

9. Solve for x: $40 = \dfrac{5(x-11)}{4} - 10$ 9. $\underline{X = 51}$

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

Name_____

For items 11-13, either explain how you solved the problem or show your work in the space provided. Identify any variables you introduce and clearly state any conclusions using complete English sentences.

11. (6 points) Assume a Honda Accord bought for $28,000 in 2004 has been losing market value at a continuously compounding rate of 14% per year.

    a. Assume that the Honda Accord's market value with continue to diminish continuously at the rate of 14% per year and write a rule for a function that will give the car's estimated market value as a function of time in terms of the number of years since 2004.

$$\text{Let } V(t) = \text{market value } t \text{ years after 2004 (\$)}$$

$$V(t) = 28000\, e^{-0.14t}$$

    b. Show how to use your function in part a. to estimate the Honda Accord's market value in the year 2008.

$$V(4) = 28000\, e^{-0.14(4)} \approx 15,994$$

The market value in 2008 will be about $15,994

    c. Show how to use your function in part a. to estimate the number of years it will take for the car's market value to depreciate to $7,000?

$$7,000 = 28000\, e^{-0.14t}$$

$$0.25 = e^{-.14t}$$

$$\ln .25 = -.14t$$

$$t \approx \frac{\ln .25}{-.14} \approx 9.9$$

It will take about 9.9 or 10 years for the market value to depreciate to $7000.

For items 13 and 14 specify the type of function that will best fit the data (linear, exponential, or power) 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. (5 points each)

12.

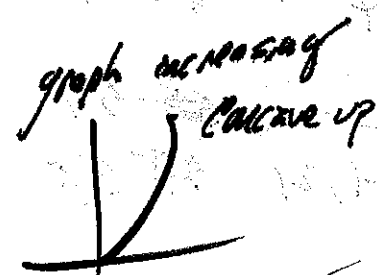| x	y	Δy	Ratio
0	100		
1	75	-25	.75
2	56.25	-18.75	.75
3	42.19	-14.06	.75
4	31.64	-10.55	.75

An Exponential function will be a good fit because the ratios are constant. The graph is decreasing and concave

$$y = 100(.75)^x$$

If $x = 10$, $y = 100(.75)^{10} \approx 5.63$

graph increasing
concave up

13.

x	y	Δy	Ratio
0	0		
1	10	10	undefined
2	28.28	18.28	2.828
3	51.96	23.68	1.837
4	80	28.04	1.540

Neither linear, exponential. Maybe a power function

$$y = 10 X^{\boxed{}} \leftarrow \text{some power}$$

If $y = 4$, y is supposed to be 80. So we solve

$$80 = 10(4)^b \quad \text{for } b.$$

$$8 = 4 \Rightarrow b = \frac{3}{2} \text{ or } 1.5$$

$$\boxed{y = 10 X^{1.5}}$$

$x = 10 \Rightarrow y = 316.23$