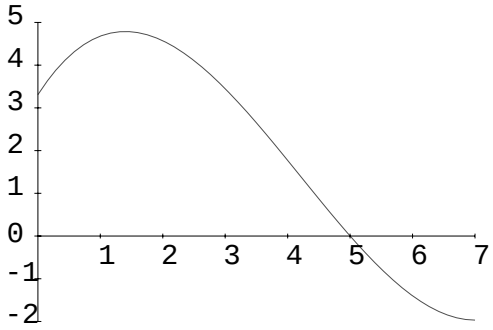
MAC 2311 Calculus 1 **Test 1** 28 Jan 1999

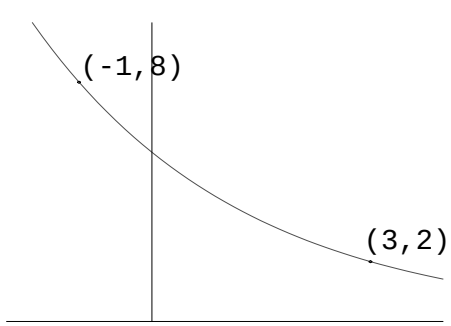
Show **ALL** work for credit; be neat; and use only **ONE** side of each page of paper. Do **NOT** write on this page. Calculators can be used for graphing and calculating only.

1. The entire graph of $y = f(x)$ is shown in Graph 1 below. Find
(a) The domain of $f(x)$.
(b) The range of $f(x)$.
(c) List all roots of $f(x)$.
(d) Is $f(x)$ concave up or concave down at $x = 6$?
(e) Is $f(x)$ concave up or concave down at $x = 3$?

Graph 1



Graph 2



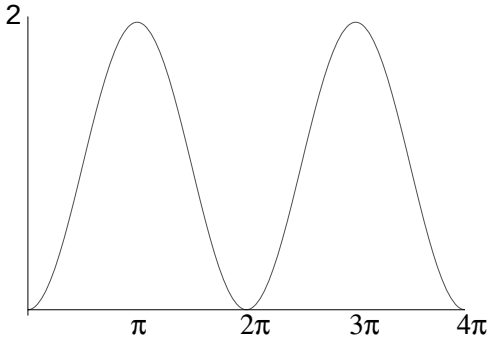
2. Find a possible equation involving a exponential for Graph 2 above. Write your equation in the $Q = Q_0 a^t$ format.

3. In each part determine which function has larger values as $x \to \infty$
(a) $x^{1/3}$ or $1000 \log x$.
(b) $1000 \cdot (1.01)^x$ or x^{101}.

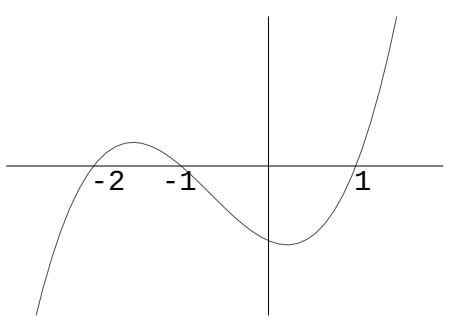
4. Find the half-life of a radioactive substance that is reduced by 30% in 20 hours.

5. Find a possible formula for the Graph 3 below. Give the period and amplitude of your function.

Graph 3



Graph 4



6. Find a possible formula for the Graph 4 above. If necessary, modify your formula for the function $f(x)$ so it satisfies the additional condition that $f(0) = -1$.

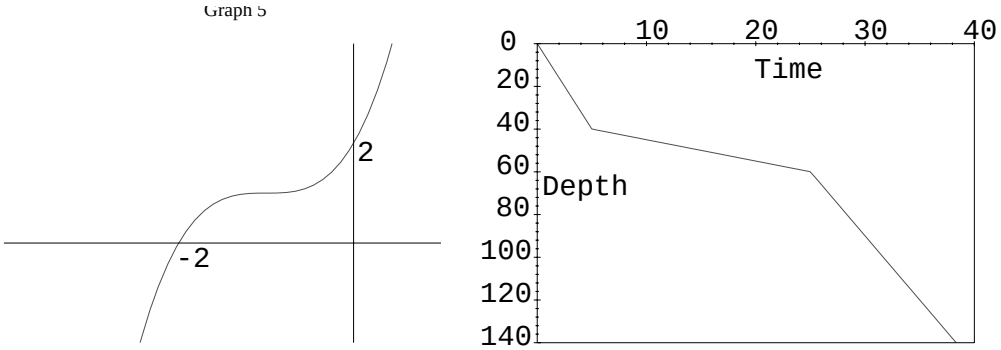
There is more test on the other side.

Welcome to test one side two.

7. The table below contains values for three different functions.
(a) Which (if any) for these functions are linear functions? For those functions which are linear, find the formula.
(b) Which (if any) of these functions are exponential functions? For those functions which are exponential, find the formula.

x	$f(x)$	$g(x)$	$h(x)$
-2	12	16	37
-1	17	24	34
0	20	36	31
1	21	54	28
2	18	81	25

8. By shifting the graph of $y = x^3$, find a cubic polynominal with the graph of Graph 5 below.



9. The graph to the above right plots $f(t)$. Here $f(t)$ is the depth in meters below the Atlantic Ocean floor where t million-year-old rocks can be found. The data is from core samples drilled by the research ship *Glomar Challenger*, drawn by Maple using a piecewise approximation to the data.
(a) Evaluate $f(15)$, and say what it means in practical terms.
(b) Evaluate $f^{-1}(120)$, and say what it means in practical terms.
(c) Sketch a graph of f^{-1}.

10. When a cold yam is put into a hot oven to bake, the temperature of the yam rises. The rate, R (in degrees per minute), at which the temperature of the yam rises is governed by Newton's Law of Heating, which says that the rate is proportional to the temperature difference between the yam and the oven. The temparature of the yam will increase quickly at first, and then increases more and more slowly. If the oven is at 350^oF and the temperatue of the yam is H^oF.
(a) Write a formula giving R as a function of H.
(b) Sketch the graph of R against H.
(c) Sketch a graph of the temperature of the yam against time.
(d) Write a possible formula for H as a function of time t.