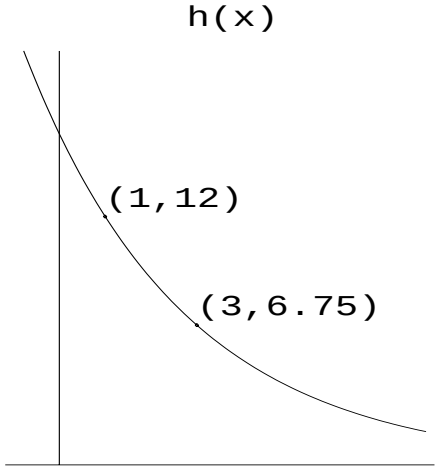
MAC 2311 Calculus 1 **Test 1** 19 Sep 2000

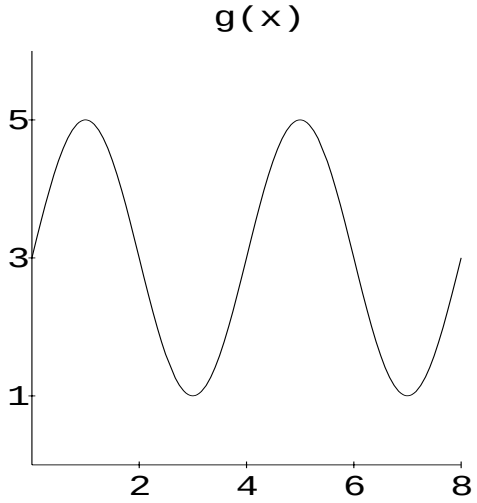
Show **ALL** work for credit; be neat; and use only **ONE** side of each page of paper. Do **NOT** write on this page. Calculators can be used for graphing and calculating only. Give exact answers when possible.

1. Use your graphing calculator to find (approximately) the two positive solutions to the equation $x^4 = 3^x$. Your answer needs to be accurate to at least three places after the decimal point.

2. In each pair below, which function will eventually be larger as x goes to infinity?
(a) $10 \cdot 2^x$ or $72,000x^{12}$ (b) $0.1x^2$ or $10^{10}x$ (c) $0.25\sqrt{x}$ or $10x^{-3}$ (d) $x^{1/2}$ or $\ln x$ (e) $\ln \ln x$ or $e^{e^x}$

3. Find a possible equation involving an exponential for the graph of $h(x)$ below.

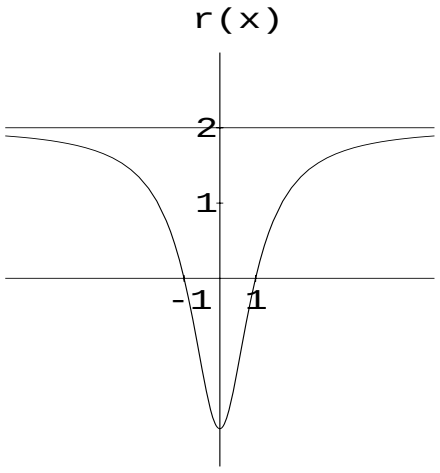


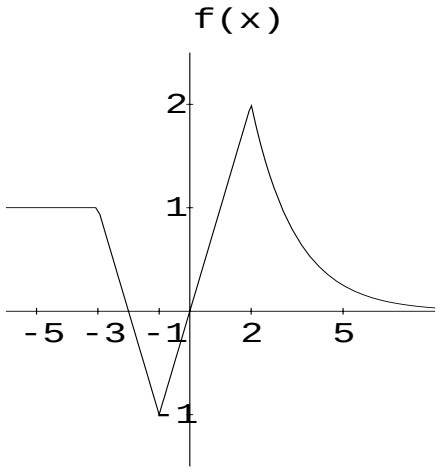




4. Find a possible formula for the graph of $g(x)$ above. Give its amplitude and period.

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

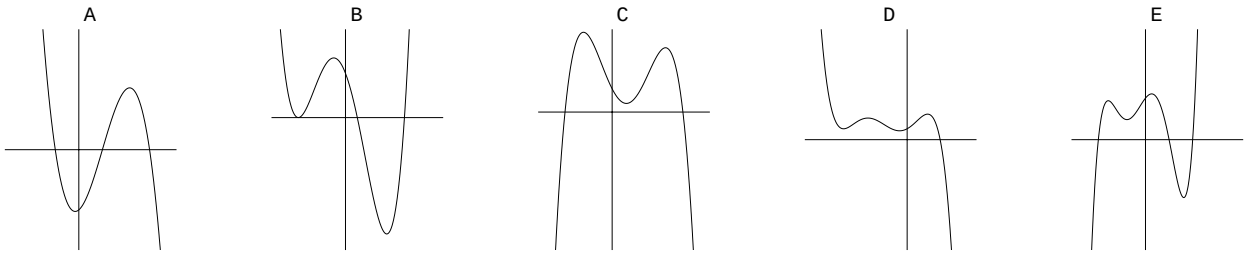
6. The graph of a rational function $y = r(x)$ is given below. If $r(x) = g(x)/h(x)$ with $h(x) = x^2 + 1$, give a possible formula for $g(x)$.




7. The graph of $y = f(x)$ is given above. Sketch the graphs of each of the following. Be sure to label the two new horizontal asymptotes values.
(a) $y = f(x) + 3$ (b) $y = 2f(x)$ (c) $y = f(x + 4)$ (d) $y = 4 - f(x)$

8. Assume that each of the graphs below is of a polynomial. For each graph determine **BOTH** the minimum possible degree of the polynomial **AND** whether the leading coefficient of the polynominal is positive or negative. (You may assume the picture shows the global behavior.)




9. The table below contains data for three different functions.

(a) Which (if any) of 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 | 42 | 27 | 32 |
| -1 | 39 | 45 | 48 |
| 0 | 36 | 75 | 72 |
| 1 | 33 | 105 | 108 |
| 2 | 30 | 135 | 162 |

10. The figure below is the graph of a function $f$ where $f(t)$ is the number (in millions) of motor vehicles registered in the world in the year $1900 + t$.

(a) Is $f$ invertible? Explain.

(b) Evaluate $f^{-1}(400)$.

(c) What is the meaning of $f^{-1}(400)$ in practical terms?

(d) Sketch the graph of $f^{-1}$.