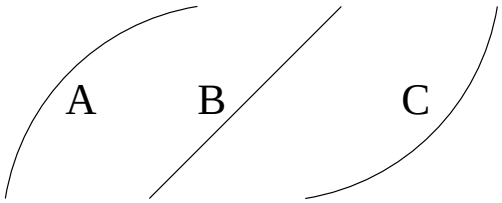
MAC 2311 Calculus 1 **Test 1** 21 Sep 1999

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. Give exact answers when possible.

1. Each of the functions in the table below is increasing, but in different ways. Which of the graphs below best fits each function.

t	$g(t)$	$h(t)$	$k(t)$
1	23	10	2.2
2	24	20	2.5
3	26	29	2.8
4	29	37	3.1
5	33	44	3.4
6	38	50	3.7

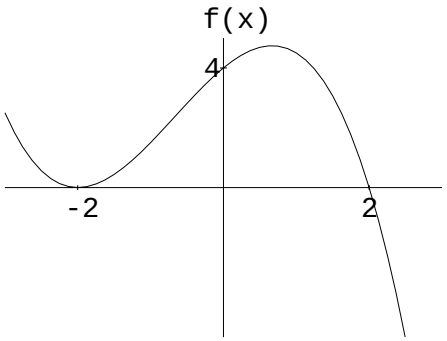


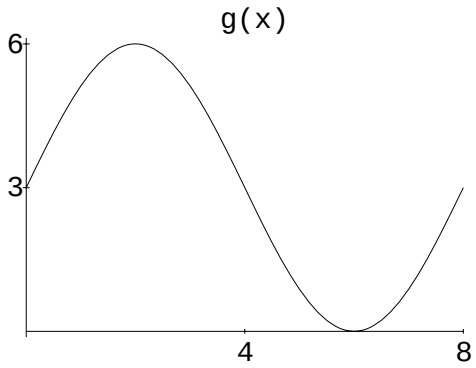
2. Suppose $C = f(A)$, where C is the cost in dollars, of building a store of area A square feet. Explain the meaning of $f(10000) = 350000$ and $f^{-1}(20000) = 4000$ in practical terms.

3. In each pair below, which function will eventually be larger as x goes to infinity?
(a) $2x^5$ or $200x^4$ (b) $10x^3$ or e^x (c) x^{-2} or x^{-5} (d) $x^{1/2}$ or $\ln x$ (e) x^π or $(1.0000001)^x$

4. After 100 years radioactive substance is reduced to 1/5 the initial amount, how long until only 1/20 of the initial amount remains?

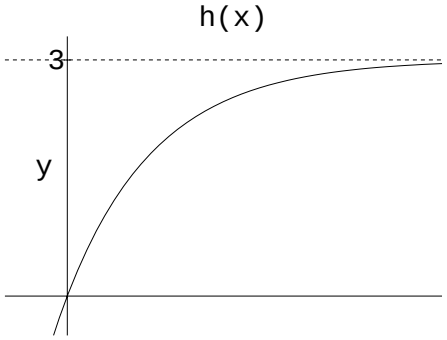
5. Determine the cubic polynominal that represents the graph of $f(x)$ below.





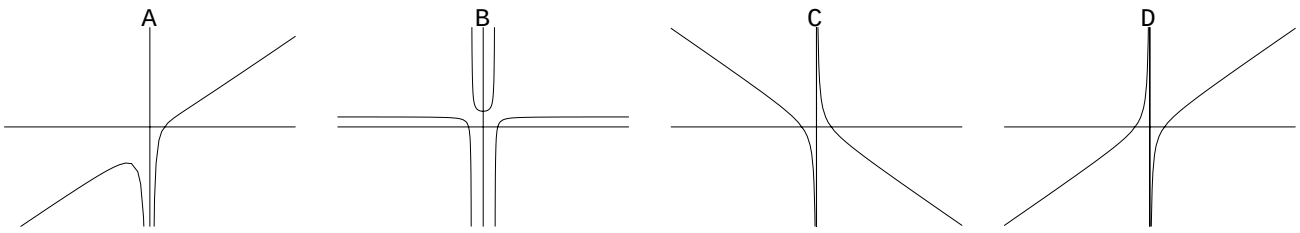
6. Find a possible formula for the graph of $g(x)$ above. Give its amplitude and period.

7. Find a possible equation involving an exponential for the graph of $h(x)$ below. Note that (0,0) is on the curve.



8. Match the following functions with the graphs below. Assume $0 < b < a$.

$$I.\quad y = \frac{a}{x} - x \qquad II.\quad y = \frac{(x-a)(x+a)}{x} \qquad III.\quad y = \frac{(x-a)(x^2+a)}{x^2} \qquad IV.\quad y = \frac{(x-a)(x+a)}{(x-b)(x+b)}$$



9. Values of three functions are given in the table below rounded to to two decimal places. One function is of the form $y = ab^t$, one is of the form $y = ct^2$ and one is of the form $y = kt^3$. Which function is which? And find the constants a, b, c and k.

t	$f(t)$	t	$g(t)$	t	$h(t)$
2.0	4.40	1.0	3.00	0.0	2.04
2.2	5.32	1.2	5.18	1.0	3.06
2.4	6.34	1.4	8.23	2.0	4.59
2.6	7.44	1.6	12.29	3.0	6.89
2.8	8.62	1.8	17.50	4.0	10.33
3.0	9.90	2.0	24.00	5.0	15.49

10. Define

$$f(x) = \frac{1}{1+e^{-x}}.$$

(a) Is f increasing or decreasing? Explain why f is invertiable.
(b) What is the domain of f^{-1}?
(c) Sketch the graphs of f and f^{-1} on the same axes, and explain their relationship.
(d) Find a formula for $f^{-1}(x)$.