MAT 195 – Spring Quarter 2002
TEST 1

NAME_____

Show work and write clearly.

1. Let $h(x) = \sqrt{x - \sqrt{x}}$. Find $h^{-1}(x)$. State the domain and range for $h(x)$ and $h^{-1}(x)$.

2. a. Assume $f(x)$ is even, complete the table below:

x	–3	–2	–1	0	1	2	3
$f(x)$							

b. Assume $f(x)$ is odd, complete the table below:

x	–3	–2	–1	0	1	2	3
$f(x)$							

c. Can a function be both odd and even? If so, then assume $f(x)$ is both even and odd and complete the table below. If not, then explain.

x	–3	–2	–1	0	1	2	3
$f(x)$							

3. Find functions f and g such that $h = f \circ g$.

a. $h(x) = 3(\sin x)^2 + 4 \sin x$

b. $h(x) = \dfrac{\tan x}{3 + \tan x}$

4. Generally, the more fertilizer that is used, the better the yield of crop. However, if too much fertilizer is applied, the crops become poisoned, and the yield goes down rapidly. Sketch a possible graph showing the yield of the crop as a function of the amount of fertilizer.

5. a. Find constants A, B, C and k such that the function $f(x) = A \cdot B^{kx} + C$ satisfies all four of the following conditions:

- $f(x)$ is an increasing function,
- $f(x) < 0$ for $x < 0$,
- $f(x) > 0$ for $x > 0$, and
- $f(x) < 2$ for all x.

b. Write the equation of the function that is obtained by shifting $f(x)$ two units to the left.

6. Find the domain and range of $f(x) = \dfrac{5}{3 - \cos 2x}$.

7. Solve the following algebraically:

a. $\ln(3x + 8) = \ln(2x + 2) + \ln(x - 2)$

b. $2e^{3x} = 4e^{5x}$

8. Find the exact value of each expression:

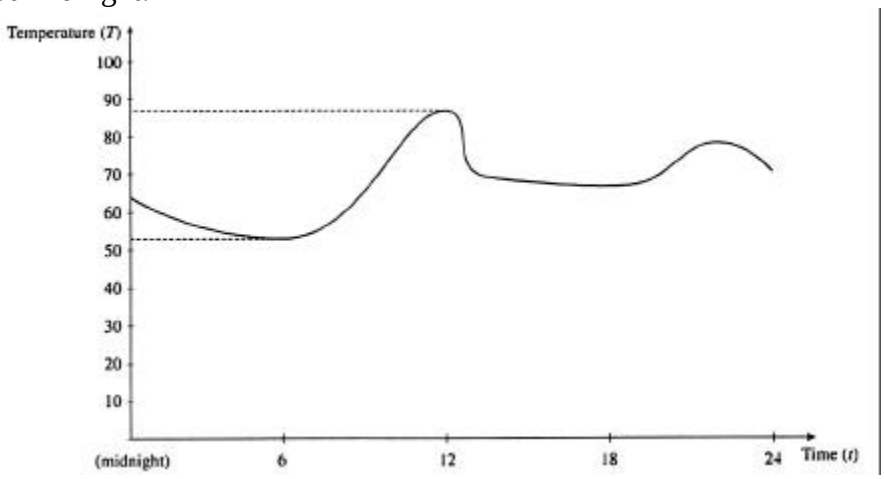
a. $\log_{1.5} \dfrac{27}{8}$

b. $\log_{0.03} \dfrac{100}{9}$

9. Let $f(x) = \dfrac{e^x + e^{-x}}{2}$ and $g(x) = \ln\left(x + \sqrt{x^2 - 1}\right)$. What are the domains of $f + g$, fg, f/g?

Extra Credit: What is the domain of $f \circ g$ OR $g \circ f$.

10. The graph below shows the temperature of a room during a summer day as a function of time, starting at midnight.



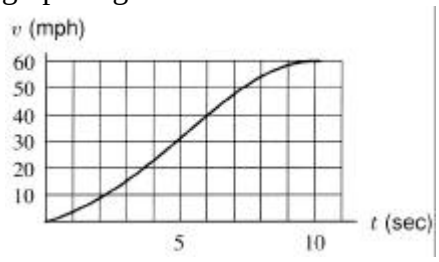
a. Evaluate f(noon) and f(6 p.m.). State the range of f.

b. Where is f increasing? Decreasing?

c. Give a possible explanation for what happened at noon.

d. Give a possible explanation why f attains its minimum value at 6 a.m.

11. Let f be the function whose graph is given below.



a. Estimate the value of $f(4)$.

b. Estimate the value(s) of x such that $f(x) = 40$.

c. On what interval is f increasing? Decreasing?

d. Is f one-to-one? Explain.

e. What is the domain and range of f^{-1}?

f. Estimate the value(s) of $f^{-1}(8)$.

g. *Extra Credit*: Estimate where $f(x) = f^{-1}(x)$.