

**Math 142**  
**Exam 1**

**Name** \_\_\_\_\_  
**ID No.** \_\_\_\_\_

Refrain from glancing at other people's test. Those who do it will get a zero score for the test.

Read each problem carefully. Ask questions if you don't understand the problems. Check your answers if you have time. Good luck.

1. (24 pts) The multiple choice questions are 3 pts each. Fill your answers in the blanks.

- (a). \_\_\_\_\_ An exponential function has the form  $y = x^a$ .  
(A) True                      (B) False.
- (b). \_\_\_\_\_  $\log_a 1 = 0$  for all  $a > 0$ .  
(A) True                      (B) False.
- (c). \_\_\_\_\_ Graphs of  $f(x)$  and  $g(x)$  are as shown,  
then  $g(x) =$   
(A)  $f(x - 1) + 2$                       (B)  $f(x + 1) - 2$   
(C)  $f(x - 2) - 1$                       (D)  $f(x - 1) - 2$   
(E) None of these.
- (d). \_\_\_\_\_  $\log_a x = 5$  and  $\log_a y = 3$ , then  $\log_a \frac{x}{y^2} =$   
(A)  $5/9$                       (B)  $5/3$                       (C)  $-1$                       (D)  $-4$                       (E) None of these.
- (e). \_\_\_\_\_  $h(x) = 3^{x^2-x+2}$  can be decomposed as 2 functions (A)  $f(x) = 3^x$ ,  $g(x) = x^2 - x + 2$   
(B)  $f(x) = x^2 - x + 2$ ,  $g(x) = 3^x$   
(C) Both A and B are correct.                      (D) None of these.
- (f). \_\_\_\_\_ The domain of  $y = \log_a(3 - x)$  is  
(A)  $x \geq 3$                       (B)  $0 < x < 3$                       (C)  $0 \leq x \leq 3$                       (D)  $x < 3$                       (E) None of these.
- (g). \_\_\_\_\_ The range of  $y = \frac{-x^2 + 6x - 10}{\sqrt{x - 5}}$  is  
(A)  $y \geq 0$                       (B)  $0 < y < 5$                       (C)  $y < 0$                       (D) all real numbers  
(E) None of these.
- (h). \_\_\_\_\_ An account has an annual interest rate of 8 % compounded quarterly. How long does it take to double the investment?  
(A) late in 8th year                      (B) beginning of 9th year                      (C) late in 9th year  
(D) beginning of 10th year                      (E) None of these.

2. (36 pts) Fill your answers in the blanks. Each blank is worth 3 pts.

(a).  $4x - 3y = 24$  has the slope-intercept form: \_\_\_\_\_, and its  $x$ -intercept = \_\_\_\_\_

(b). Solve for  $x$  if  $3^{x-9} = 27^{4-2x}$ .  $x =$  \_\_\_\_\_

(c).  $y = x^2 + 3x + 2$ . When  $y = 4\sqrt{7}$ , the **positive** solution of  $x =$  \_\_\_\_\_ (Keep 3 decimal digits.)

(d).  $f(x) = \sqrt{x-1}$ ,  $g(x) = \sqrt{9-x}$ ,  $h(x) = x^3$ . Find the following functions and their domains.

$f(x-2) =$  \_\_\_\_\_  $D =$  \_\_\_\_\_

$(f+g)(x) =$  \_\_\_\_\_  $D =$  \_\_\_\_\_

$(f/g)(x) =$  \_\_\_\_\_  $D =$  \_\_\_\_\_

$(f \circ h)(x) =$  \_\_\_\_\_  $D =$  \_\_\_\_\_

3. (15 pts) Mr. Smith runs advertisements at a TV station to promote his used car sale business. He collects the data relating advertising spots and the number of sales per month as following:

$x$ (no. of ads run)	7	14	20	26	30	35	40
$y$ (no. of cars sold)	14	20	25	27	29	31	32

Fit the data points with quadratic, cubic and logarithmic regression functions.

(a). Which of the 3 models gives the best fit to the data points? Explain why.

(b). If Mr. Smith wants to extrapolate, which of the 3 models makes most sense then? Explain why.

4. (7 pts) Write  $2 \log x + 3 \log y - \frac{3}{2} \log z - 4 \log w$  as one long logarithm. Show all work.

5. (8 pts) Find where the revenue function is maximized and the maximum value if the demand function is  $p = -.8x + 48$ . Show all work.

6. (10 pts) When the unit price of a product is \$4, the demand is 120 units daily. If the price is \$6, the daily demand is 90 units. Assume that the demand is a linear function of the price. Find the demand function in the slope-intercept form. What is the demand when the unit price is \$5.2? Be sure to **define your variables** and show all work.