

Follow directions carefully:

- Write your name, section number, and instructor's name on this test and on **each** of the 7 answer sheets.
- Number the answer sheets 1 through 7
- Do each problem on ONE answer sheet as directed on the test.
- Mark your answers clearly. You must show all appropriate work in order to receive credit for an answer. You may use **ONLY SCIENTIFIC** calculators. Show work algebraically and give exact answers where indicated.
- Clearly indicate your answer, and write answers in simplified form.
- Sign the Honor Pledge on answer sheet #1.

Use both front and back of a sheet if needed. Do not use another answer sheet. Only the problems assigned to a particular sheet should appear on that sheet as indicated on the exam. If more than one answer is given, or if the answer cannot be found, you may lose points. POINTS MAY BE DEDUCTED IF DIRECTIONS ARE NOT FOLLOWED.

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**Answer problem 1 on answer sheet # 1**

1. (a) For the questions below, use: A (3, -2) and B (7, 0).

[6-6-6 pts]

- (i) Determine the equation of the horizontal line that passes through the point A and state what its slope is.
  - (ii) Find the distance from point A to point B. Write your answer as an exact answer in simplified form.
  - (iii) Find the equation of the circle whose center is the midpoint of line segment AB, and whose radius is 9 units.
- (b) Determine the equation of the line which passes through the vertex of the graph of the function  $f(x) = (x-1)^2 - 8$  and is parallel to the line  $y = -x + 10$ .

[8]

- (c) Write an equation for the function whose graph is a result of shifting the graph of the function  $y = \sqrt{x}$  4 units to the right and 9 units down.

[6]

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**Answer problem 2 on answer sheet # 2**

2. (a) Find the x-intercepts of the function  $y = (x-4)^2 - 45$  Write your answer as exact values.

[6]

- (b) Find the x-intercept of the graph of the function  $f(x) = \frac{3x-9}{x+5}$

[5]

- (c) Solve for t:  $\frac{1}{r} + \frac{1}{s} = \frac{1}{t}$

[6]

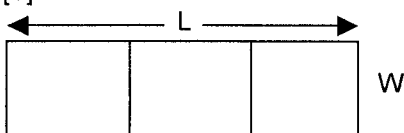
- (d) Solve for x:  $(x-1)^{3/2} = 27$

[6]

- (e) A rancher is given 240 ft. of fencing by a neighbor. He needs a corral for his livestock and decides to enclose 3 adjacent rectangular corrals (see figure).

[5]

Write a quadratic function expressing the area in terms of the width, W, of the field.



**Answer problem 3 on answer sheet # 3**

3. (a) Find all values of  $x$  that satisfy the following conditions:  $y_1 = x - 4$  ;  $y_2 = x + 1$  ; and  $y_1 y_2 = -6$   
[6]

(b) State the domain of each of the following functions:

[6] (i)  $f(x) = \ln(x - 12)$

(ii)  $g(x) = \frac{x - 2}{\sqrt{x + 4}}$

[6] (c)  $f(x) = 3x - 1$  Find and simplify the difference quotient  $\frac{f(x+h) - f(x)}{h}, h \neq 0$ . Show all work.

[4] (d) State the equation(s) of the horizontal asymptote(s) of the graph of the function  $f(x) = \frac{4x - 1}{x + 1}$

[4] (e) State the equation(s) of the vertical asymptote(s) of the graph of the function  $f$  given in part (d) above.

**Answer problem 4 on answer sheet # 4**

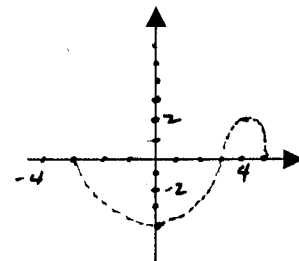
4. (a)  $f(x) = \frac{x^{-1} - (x+3)^{-1}}{4}$  ;  $g(x) = x - 3$  Find and simplify:  $(f \circ g)(x)$   
[5]

(b)  $f(x) = \ln(x - 8)$  and  $g(x) = \log_3 \frac{1}{x}$  Find  $(f + g)(9)$   
[6]

(c) Find all zeros of the function  $f(x) = 2(x - 4)(x + 9)^2$ , and give the multiplicity for each zero. State whether the graph crosses the x-axis, or touches the x-axis and turns around, at each zero.  
[6]

(d) Explain what is meant by the statement: "The half-life of a radioactive isotope is 400 years"  
[4]

- (e) For the function,  $f$ , whose graph is shown:  
[3 ea.]
- (i) State the range of  $f$ .
  - (ii) Determine the interval(s) over which  $f$  is increasing.
  - (iii) What are the zeros of the function  $f$ ?
  - (iv) What is the value of  $f(4)$ ?



**Answer problem 5 on answer sheet # 5**

5. (a) Write the following as a single logarithmic expression:  $\frac{1}{2} \ln(x^2 + 4) - 5 \ln(x - 2)$

[5]

(b) Solve for x:  $\log(x - 90) + \log x = 3$

[8]

(c) Solve for x, writing your answer as an exact answer:  $\ln \sqrt{x - 2} = 3$

[6]

(d) Solve for x:  $3e^{4x-1} - 10 = 17$

[5]

(e) A person invests an amount of money into an account. The amount in the account after t years is given by  $A = 20,000e^{rt}$ , where r represents the rate, and where t = 0 corresponds to 1995. If the interest rate is 5%, when will the amount in the account be double what it was in 1995 ?

[6]

**Answer problem 6 on answer sheet # 6**

6. (a) Use matrix row operations to obtain a "0" in the position indicated by the box, then write the new matrix.

$$\begin{bmatrix} 1 & 4 & 0 & -8 \\ 0 & -1 & 2 & 2 \\ 0 & \boxed{4} & -2 & -8 \end{bmatrix}$$

[6]

(b) Solve the following system of equations, writing your answer as (an) ordered pair(s).

[6] 
$$\begin{aligned} x^2 + y^2 &= 10 \\ x &= y - 2 \end{aligned}$$

(c) Draw a set of axes on your answer sheet and sketch the graph of the following system of inequalities. Label the solution region "S".

[8] 
$$\begin{aligned} 2x + y &\leq 12 \\ 2x - 3y &> 6 \\ x &> 3 \end{aligned}$$

(d) Let  $A = \begin{bmatrix} 1 & 0 & -5 \\ -2 & 1 & -1 \end{bmatrix}$   $B = \begin{bmatrix} 2 & -5 \\ 0 & 2 \end{bmatrix}$  Find BA, if possible.

[5]

**Question 7 Answer on Answer Sheet # 7**

7. (a) Evaluate:  $\sum_{n=1}^3 (2n-1)n!$

[5]

(b) Fireworks are launched into the air. The height, in feet, of the fireworks  $t$  seconds after they are launched, is represented by the function  $s(t) = -16t^2 + 180t + 3$

[8]

(i) Determine when the fireworks should explode so that they go off at the greatest height.

(ii) When will the fireworks be at a height of 380 feet?

(c) The shaded portion (labeled "S") of the graph on the right represents the set of feasible solutions when the objective function

$$z = 2x + 5y$$

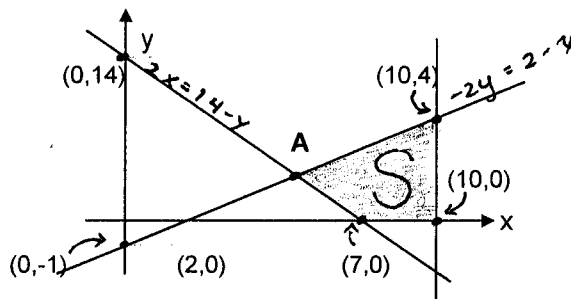
is subject to the constraints:

$$-2y \geq 2 - x$$

$$2x \geq 14 - y$$

$$x \leq 10$$

$$y \geq 0$$



(i) Determine the coordinates of vertex **A**. Show your work algebraically.

[5]

(ii) Find the maximum value of the objective function  $z$ , given above, subject to the given constraints.

[5]

(iii) Suppose the objective function  $z$  above represents the profit, in 1000's of dollars, a company makes on selling model A computers and model B computers. Suppose also that in the above problem  $x$  represents the number of model A computers sold, in 100's, and  $y$  represents the number of model B computers sold, in 100's. Explain the meaning of your answer to part (ii), the maximum value of the objective function,  $z$ , in relation to the number of computers sold.

[3]

T H E E N D