

**Jacky Peterson-Math**

MAT150- TEST #3

NAME \_\_\_\_\_

CHAPTER 2

SCORE \_\_\_\_\_

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**PENCIL/PAPER SECTION - Use Calculator to help you with numerical calculations only and to check your work. ALL WORK MUST BE SHOWN IN ORDER TO RECEIVE CREDIT!!!**

1. Find the complex zeros of the following quadratic function:  $g(x) = x^2 - 4x + 8$   
\_\_\_\_\_ (5)

2. Using an appropriate **Substitution** solve the following equation for x.  
 $3x - 5\sqrt{x} + 2 = 0$  \_\_\_\_\_ (5)

3. Given:  $f(x) = -2(x - 1)^2 + 3$  (5 points)  
a) List the transformation: Basic Function: \_\_\_\_\_  
1:  
2:  
3:  
4:

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4. Given:  $f(x) = -2x^2 + 8x$

a) Find the Vertex.

a) \_\_\_\_\_(4)

b) Find the domain and range of f(x)

b) Domain: \_\_\_\_\_(2)

Range \_\_\_\_\_(2)

c) Find the Axis of Symmetry.

c) \_\_\_\_\_(2)

d) How does f(x) open (up/down/left/right)?

d) \_\_\_\_\_(1)

e) Does it have a minimum or maximum?

e) \_\_\_\_\_(1)

What is that maximum or minimum value?

\_\_\_\_\_ (1)

f) Find the x-intercept(s). Write your answer as (x,y) coordinate point(s)

f) \_\_\_\_\_(3)

g) Find the y-intercept.

g) \_\_\_\_\_(2)

h) Where is f(x) increasing?

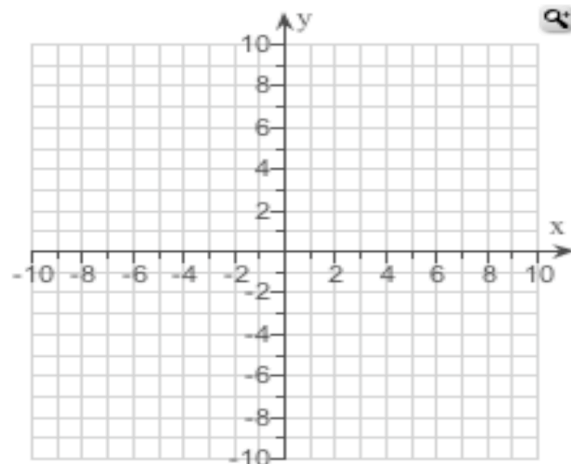
h) \_\_\_\_\_(2)

i) Where is f(x) decreasing?

i) \_\_\_\_\_(2)

j) Graph f(x) (3 points)

(Scale your graph paper if you need to.)



5. What are the points of intersection of the following two functions.  
(i.e. where  $f(x) = g(x)$  ) Write your answer(s) as (x,y) coordinate point(s).

$$f(x) = x^2 - x + 1$$

$$g(x) = 2x^2 - 3x - 14$$

\_\_\_\_\_ (8)

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6. A driver's age has something to do with his or her chance of getting into a fatal car crash. The function below models the number of fatal vehicle crashes per 100 million miles driven for drivers of various age groups.  $f(x)$  is the number of fatal vehicle crashes per 100 million miles and  $x$  the drivers age.

$$f(x) = 0.013x^2 - 1.19x + 28.24$$

- a. What is the number of crashes for an individual who is 30 years old?  
\_\_\_\_\_ (3)
  
- b. Does the above function have a maximum or minimum? \_\_\_\_\_ (2)  
How do you know? \_\_\_\_\_ (1)
  
- c. At what age will the number of crashes be a maximum or minimum?  
\_\_\_\_\_ (3)
  
- d. What is the minimum of crashes? \_\_\_\_\_ (3)

**CALCULATOR SECTION – This section is calculator driven. Show all algebra work where necessary.**

7. The table shows the spending per pupil in public schools  $S(x)$  (1970 thru 2000)

|                          |      |      |      |      |
|--------------------------|------|------|------|------|
| Year                     | 1970 | 1980 | 1990 | 2000 |
| Spending per pupil in \$ | 2000 | 3000 | 4100 | 5500 |

a. Align the data with  $x$  the number of years after 1970: ( 1 points)

|                                 |      |      |      |      |
|---------------------------------|------|------|------|------|
| Year ( $x$ )                    |      |      |      |      |
| Spending per pupil in \$ $S(x)$ | 2000 | 3000 | 4100 | 5500 |

b. Input Variable: \_\_\_\_\_(1)

Description of Input variable: \_\_\_\_\_(1)

Output Variable: \_\_\_\_\_(1) Output units: \_\_\_\_\_(1)

Description of Output variable: \_\_\_\_\_(1)

c. Draw a scatter diagram of the above data. Besure to label the axis with the correct variable and units. (3 points)



c. Use your graphing calculator to find a **linear** model for the spending per pupil in public schools as a function of the number of years past 1970. Call the model  **$S(x)$**  and **round your answer to 2 decimal places if necessary:** (4 points)

d) What is the correlation Coefficient?  
State your answer to 5 decimal places. \_\_\_\_\_(2)

e) How good is the fit and how do you know? (3 points)

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Problem #8 – Continued

f. Interpret the slope of the line you found in part c in the context of this problem. Write your answer as a complete sentence. (3 points)

g. i) Use the model you found in part c to estimate the spending per pupil in the year 2010. Be sure to carefully label your answer. Write your answer in a complete sentence. (3 points)

ii) Use the model our found to estimate the year when the spending per pupil will reach \$7000? Write your answer in a complete sentence. (4 points)

8. The data in the following table shows the average number of miles per gallon for U.S. automobiles in the year 1940 thru 2000. Let  $x$  be the number of years after 1940 and  $y$  be the number of miles per gallon for US autos.

a. Align the data. (2 points)

|   |      |      |      |      |      |      |      |
|---|------|------|------|------|------|------|------|
| <b>Year</b>                                   | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 |
| <b>X = # years after 1940</b>                 |      |      |      |      |      |      |      |
| <b>Y = Average number of miles per gallon</b> | 14.8 | 13.9 | 13.4 | 13.5 | 15.9 | 20.0 | 22.0 |

b. Identify the parts of the model:

Input Variable: \_\_\_\_\_ (1)

Description of Input variable: \_\_\_\_\_ (1)

Output Variable: \_\_\_\_\_ (1) Output units: \_\_\_\_\_ (1)

Description of Output variable: (1 points)

c. Use your calculator to find a **quadratic function** of best fit. Round your answer to the nearest hundredth (two decimal places). (5 points)

d. Predict the number of miles per gallon in the year 2010. (4 points)

Write your answer in part d) as a complete sentence:

Problem #8 continued

- e. Does your model have a maximum or minimum? (2 points)
- f) Predict the year when the miles per gallon will be a minimum (or maximum).  
State your answer as a complete sentence. (5 points)

What is that maximum (or minimum value).  
State your answer as a complete sentence. (3 points)