

MAT151 – College Algebra/Functions

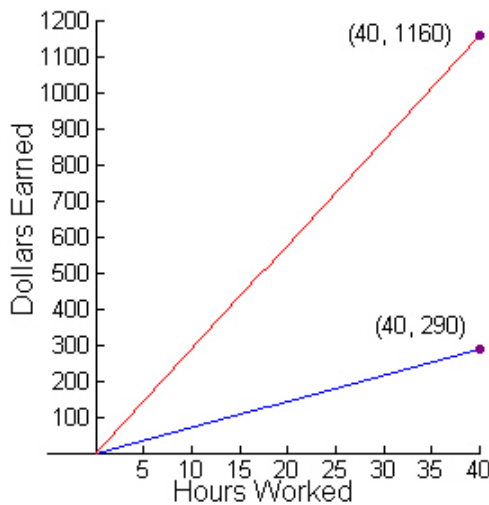
Exam 2 – Transformation of Functions and Quadratic Functions

Print it, solve it (clear and understandable handwriting), take a picture, and mail it to me as a pdf file.

Name: _____

Directions: Read each question carefully. Points are awarded based on work shown, completeness and clarity of responses. Don't round numbers until you have reached the final answer, then use 3 decimal places. Clearly identify the answer in space provided. Include labels where appropriate.

1. **(10 points)** The figure shows the earnings of two different workers as a function of the number of hours worked during the week. Demonstrate your choose.



Which of the following statements is true?

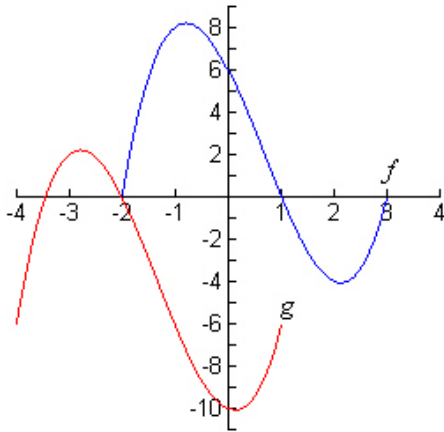
- a. The earnings graph of the worker with the higher hourly wage may be obtained by shifting the earnings graph of the worker with the lower hourly wage up by 870 dollars.
- b. The earnings graph of the worker with the higher hourly wage may be obtained by vertically stretching the earnings graph of the worker with the lower hourly wage by a factor of 870.
- c. The earnings graph of the worker with the higher hourly wage may be obtained by horizontally stretching the earnings graph of the worker with the lower hourly wage by a factor of 10.
- d. The earnings graph of the worker with the higher hourly wage may be obtained by vertically stretching the earnings graph of the worker with the lower hourly wage by a factor of 4.

2. **(10 points)** Which of the following statements is false?

- a. A concave up graph has an increasing rate of change.
- b. A concave down graph has a decreasing rate of change.
- c. A linear graph has a constant rate of change
- d. All nonlinear functions have inflection points.

3. **(10 points)** The figure shows the graph of a function f and a function g . Function g is a transformation of function f .

- Describe the transformation of f to get g **(5 points)**.
- Write an equation for g as a transformation of f **(5 points)**.



4. **(10 points)** Algebraically, find the coordinates of the vertex of the quadratic function $y = x^2 + x + 6$. You can check using your graphic calculator or Desmos. **Show your work.**

5. **(10 points)** The equation $s(t) = -16t^2 + 30t + 6$ models the height of a ball (in feet) after t seconds when it is thrown up into the air at an initial velocity of 30 feet per second. According to the model, when the ball will strike the ground? Use the method you want but show your work and explain.

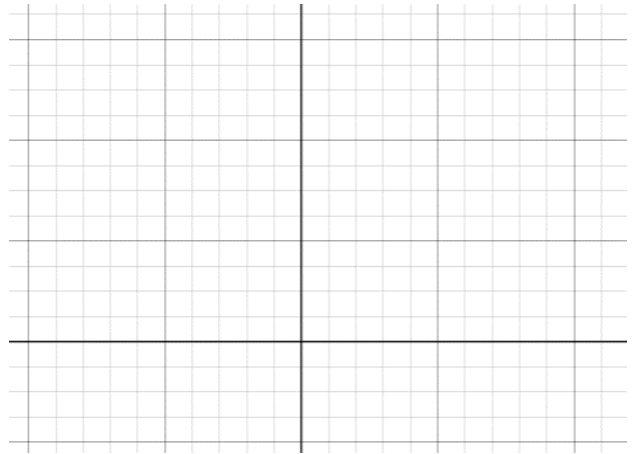
6. **(20 points)** The table shows the purchasing power of the U.S. dollar between 1980 and 2005 in constant 1982 dollars. That is, in 1982 the dollar is valued at \$1.000 (Source: Statistical Abstract of the United States: 2007, Table 705).

- a. Identify the dependent variable, the independent variable and write the function notation **(5 points)**.
- b. Calculate the first and second differences for the table data **(10 points)**.
- c. Explain what the differences tell us about the graph of the data (increasing or decreasing function, concave up or concave down and why) **(5 points)**

Years (Since 1980) t	Value of the dollar (dollars) V	First Differences	Second Differences
0	1.215		
5	0.928		
10	0.766		
15	0.656		
20	0.581		
25	0.512		

7. **(30 points)** The term *e-commerce* refers to the sale of products and services online. The U.S. Department of Commerce classifies online sales by category. The *Nonstore Retail* category includes online sales of mail order and catalog companies and of exclusively online companies. The table shows the e-commerce revenue for the Nonstore Retail category for 2000 to 2008 as reported by the U.S. Census Bureau (Source: www.census.gov).

Years (t) (Since 2000)	Revenue (R) (billion dollars)
0	22
1	26
2	33
3	42
4	54
5	68
6	78
7	93
8	111



a. Find the equation of the quadratic function that best fits the data. Interpret the coefficient of determination (Use proper notation) **(10 points)**.

b. Use the regression equation to forecast Nonstore Retail sales in 2020. State your answer **(10 points)**.

c. Graph the function using the proper labels **(10 points)**.