

Do NOT write your name anywhere. (Canvas will tell me who turned in the exam.) Take pictures of your answers and use your own software or <https://pdfcandy.com/> to create a PDF for each answer which requires an upload. If it is large, resize it to A4. Upload that to Canvas. Upload each answer as a separate file with that question. Failure to follow directions will cost you one point. People with Apple products may need to use CamScanner app.

You are not allowed to use your books, notes, the internet, or other people when taking this test. You can use the internet to access Canvas and to convert your answers to PDF files. Nothing else.

If you run out of time or lose your internet connection, you can do a second submission. You do NOT have to redo the questions you already did. I will be able to see every submission. If you have problems, you can always contact me via Zoom or e-mail. If you use Zoom, open it in a new tab or window.

Failure to follow these directions will cost you 1 point. The test has 100 points (to be scaled up to 140 points) and is scheduled to take 50 minutes. Therefore, expect to spend 1 minute for every 2 points. For example, a 12-point question should take 6 minutes. I have it set up to only give you an hour and a half.

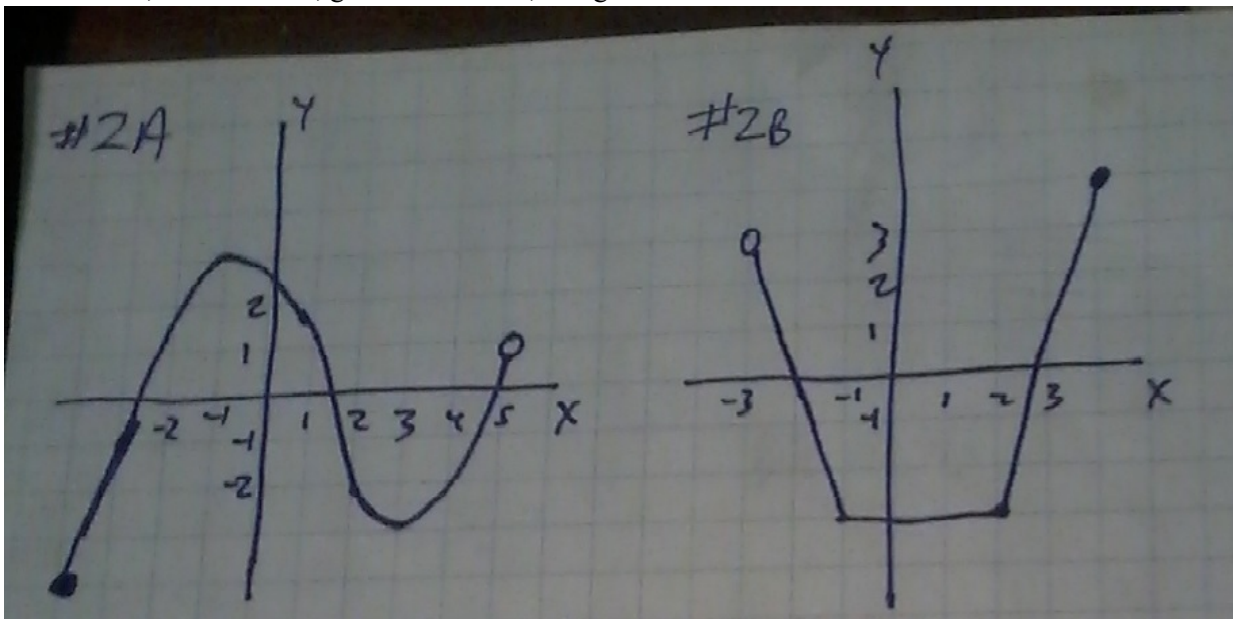
**Show all work on all questions.**

1) (10 points) For EITHER the equation in Part A OR the equation in Part B, determine if it is odd, even or neither. Which type of symmetry is that? Briefly explain your logic.

A)  $f(x) = |x^3 + x|$

B)  $f(x) = x^{1/3} + 1/x$

2) (12 points) For EITHER the graph in Part A OR the graph in Part B, find the intervals where it is an increasing function, the intervals where it is a decreasing function, where it is a constant function, the local maxima, local minima, global maximum, and global minimum.



3) (12 points) Plot EITHER the function in Part A OR the function in Part B.

A)  $f(x) = \begin{cases} 2x & x < -3 \\ 2 - x & x \geq -3 \end{cases}$

B)  $f(x) = \begin{cases} x - 3 & x < 2 \\ 2x & x \geq 2 \end{cases}$

4) (12 points) Using the graph I am supplying, draw EITHER the transformation in Part A OR the transformation in Part B. State the domain and range of the new graph.

A)  $y = f(x+2) + 1$

B)  $y = f(x-3) + 2$

5) (12 points) Using the graph I am supplying, draw EITHER the transformation in Part A OR the transformation in Part B. State the domain and range of the new graph.

A)  $y = -2f(x/3)$

B)  $y = -\frac{1}{4}f(2x)$

6) (16 points) Using the graph I am supplying, draw EITHER the transformation in Part A OR the transformation in Part B. State the domain and range of the new graph.

A)  $y = \frac{1}{2}f(-\frac{1}{4}x + 1) - 3$

B)  $y = \frac{3}{4}f(-3x - 2) + 4$

7) (26 points) Answer EITHER Part A OR Part B.

A) Suppose the price function is given by  $P(Q) = 10 - \frac{1}{2}Q$  and the total cost function is given by  $C(Q) = 24 + 2Q$ . Find the revenue function  $R(Q)$ , average cost function  $\bar{C}(Q)$ ; and the profit function  $\Pi(Q)$ . Find the domain and range of the price function. Find  $\Pi(0)$  and interpret that. Find the zeros of the profit function and interpret them.

B) Suppose that  $F(x) = x^3 + 3x^2 + 4x + 5$ . Write out the difference quotient and simplify it.

