Show all your work in order to get full credit. Each question is worth 6 points, but questions 9 and 10 are worth 5 points each.

1. It costs a company $58 to produce 6 units of a product and $78 to produce 10 units. Write the cost function, assuming that the cost function is linear.

   \[
   \begin{align*}
   &y_1 = 58, \quad x_1 = 6 \\
   &y_2 = 78, \quad x_2 = 10 \\
   \text{slope formula:} \quad &m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{78 - 58}{10 - 6} = \frac{20}{4} = 5 \\
   \text{so} \quad &y = 5x + b \\
   \text{substitute} \quad &x = 6, \quad y = 58 \text{ to find } b \\
   58 &= 5 \cdot 6 + b \\
   58 &= 30 + b \\
   b &= 28
   \end{align*}
   \]

2. Write the equation of a line passing through (-8, -4) and perpendicular to the line \( y = \frac{1}{6}x + 3 \).

   \[
   \begin{align*}
   m_1 &= \frac{1}{6} \\
   \frac{1}{6} m_2 &= -1 \\
   m_2 &= -6 \\
   y &= m_2 x + b \\
   y &= -6x + b
   \end{align*}
   \]

3. Use the function \( g(x) = 3|x + 2| - 1 \) to answer questions 3-5.

3. What is the parent/base function?

   \( y = |x| \)

4. Describe the sequence of transformations from the parent/base function to \( g(x) \).

   \[
   \begin{align*}
   \text{Step 1:} \quad &\text{Shift the graph of } y = |x| \text{ horizontally to the left by 2 units} \\
   \text{Step 2:} \quad &\text{Vertically stretch the graph resulted from step 1 by a factor of 3} \\
   \text{Step 3:} \quad &\text{Vertically shift the graph resulted from step 2 downward by 1 unit.}
   \end{align*}
   \]

5. Graph \( g(x) \).
6. Check if the function is even, odd, or neither. \( m(x) = x^2 + x^3 \). Show your work.

\[
\begin{align*}
\text{Check "even"} & \quad \text{check "odd"} \\
m(-x) &= (-x)^2 + (-x)^3 \\
&= x^2 - x^3 \\
&=-m(-x) = -(x^2 - x^3) \\
&= -x^2 + x^3 \\
m(-x) &\neq m(x) \\
m(x) &\neq -m(-x) \\
\text{Not even.} & \quad \text{Not odd.}
\end{align*}
\]

Use the graph of \( y = f(x) \) is given below to answer questions 7-8.

7. Graph \( y = -f(x) \)

8. Find the intervals on which the graph of \( f(x) \) is increasing or decreasing.

\[
\text{increasing: } (-1, 2) \quad \text{decreasing: } (2, 4)
\]

Use the following piece-wise function to answer question 9 - 10.

\[
f(x) = \begin{cases} 
  x^2 & \text{for } -2 \leq x < 1 \\
  3 & \text{for } 1 \leq x \leq 4 
\end{cases}
\]

9. \( f(-2) \)
\[
= (-2)^2 = 4
\]

10. \( f(1) \)
\[
= 3
\]
11. Find the difference quotient \( \frac{f(x+h) - f(x)}{h} \) if \( f(x) = x^2 - 3 \).

\[
f(x+h) = (x+h)^2 - 3 = x^2 + 2xh + h^2 - 3
\]

then \( \frac{f(x+h) - f(x)}{h} = \frac{x^2 + 2xh + h^2 - 3 - (x^2 - 3)}{h} = \frac{2xh + h^2}{h} = 2x + h \)

Given \( f(x) = 3x + 4 \) and \( g(x) = \sqrt{x + 1} \), find

12. \( (f \circ g)(x) = f(g(x)) \)

\[
= 3\sqrt{x + 1} + 4
\]

13. the domain of \( (f \circ g)(x) \)

\[
x + 1 \geq 0
\]

\[
x \geq -1
\]

domain : \( [-1, \infty) \)

14. Given \( h(x) = \sqrt{x + 5} \), find the two functions \( f \) and \( g \) such that \( h(x) = (f \circ g)(x) \).

\[
h(x) = (f \circ g)(x)
\]

\[
f(x) = \frac{3}{x}
\]

\[
g(x) = x + 5
\]

Use the function \( f(x) = (x+2)^2 - 1 \) to answer questions 15-17:

15. Identify the vertex

\[
( -2, -1 )
\]

16. Find the \( x \) and \( y \) intercepts.

\[
 x - 1 \neq 0
\]

\[
 let \ y = 0 : \ 0 = (x+2)^2 - 1
\]

\[
 (x+2)^2 = 1
\]

\[
 x + 2 = \pm 1
\]

17. Graph the function.

\[
 x + 2 = 1 \ \text{or} \ x + 2 = -1
\]

\[
 x = -1 \ \text{or} \ x = -3
\]

\[
 (-1, 0), (-3, 0)
\]

\[
 y - 1 \neq 0
\]

\[
 let \ x = 0
\]

\[
 y = (0+2)^2 - 1
\]

\[
 y = 4 - 1 = 3
\]

\[
 (0, 3)