1. (17 pts) Consider the function \( f(x) \) given by the following graph of \( y = f(x) \).

(a) (3 pts) Evaluate \( f(2) \).

\[
 f(2) = 1
\]

(b) (3 pts) Does \( f(x) \) have an inverse function? Why or why not?

\[ \text{No, fails the horizontal line test.} \]

(c) (3 pts) What are the interval(s) where \( f(x) \) is increasing?

\[
\left[-2, 0\right], \left[2, 3\right]
\]

(d) (3 pts) Which symmetries does the graph \( y = f(x) \) satisfy? \( y \)-axis symmetry? \( x \)-axis symmetry? Origin symmetry? Note: This is a hand-drawn graph, so it cannot be perfect. If it seems very close to having a given symmetry, then it does have that symmetry for the purposes of this test.

\( y \)-axis symmetry only.
(e) (5 pts) On the axes provided, sketch the graph of $y = -f(x + 1)$. (The other axes at the bottom of the page may be used for practice or intermediate steps.)

Answer:

(see below)

Extra xy axes for practice:
2. (10 pts) Consider

\[ F(x) = \frac{x + 5}{2x + 1}. \]

(a) (5 pts) Compute the inverse function \( F^{-1}(x) \). Show your work.

\[
\begin{align*}
  y &= F(x) = \frac{x + 5}{2x + 1} \\
  \text{Switch } x \text{ and } y: &\quad \frac{y + 5}{2y + 1} \\
  \text{Solve for } y: &\quad (2y + 1)x = y + 5 \\
  &\quad 2xy + x = y + 5 \\
  &\quad 2xy - y = 5 - x \\
  &\quad (2x - 1)y = 5 - x \\
  &\quad y = \frac{5 - x}{2x - 1} = F^{-1}(x)
\end{align*}
\]

(b) (5 pts) Compute \( (F \circ F)(0) \). Show your work. You may express your answer either as a fraction or as a decimal number.

\[
(F \circ F)(0) = F(F(0)) = F\left(\frac{0 + 5}{2(0) + 1}\right) = \\
F(5) = \frac{5 + 5}{2(5) + 1} = \frac{10}{11}
\]
3. (16 pts)

(a) (4 pts) On the axes provided, sketch the graph of \( y = x^2 \). Clearly label the intercepts.

(b) (4 pts) On the axes provided, sketch the graph of \( y = 2x + 1 \). Clearly label the intercepts.
(c) (4 pts) On the axes provided, sketch the graph of

\[ y = g(x) = \begin{cases} 
  x^2 & \text{for } x < 0 \\
  2x + 1 & \text{for } x \geq 1.
\end{cases} \]

(d) (4 pts) Find the domain and the range of the function \( g(x) \) defined above. Put your answers in the boxes provided and in interval notation.

Domain: \( \left( -\infty, 0 \right) \cup \left[ 1, \infty \right) \)

Range: \( (0, \infty) \)

\( g(x) \) defined for \( x < 0 \) \(( -\infty, 0)\)
and \( x \geq 1 \) \([1, \infty)\)

For range, project graph to \( y \)-axis.