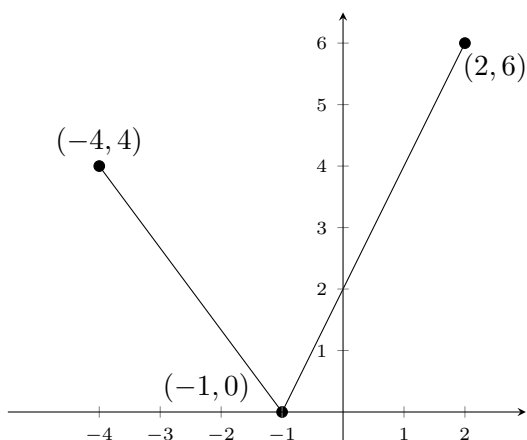# WRITTEN ASSIGNMENT #1 - SOLUTION

Let $f(x)$ be defined by the following three properties.

- The domain of $f(x)$ is $[-4, 2]$.

- The graph of $f(x)$ for x in $[-4, -1]$ is a straight line from the point $(-4, 4)$ to the point $(-1, 0)$.

- The graph of $f(x)$ for x in $[-1, 2]$ is a straight line from the point $(-1, 0)$ to the point $(2, 6)$.

1. (1 point) Sketch the graph of $f(x)$

Solution:

2. (2 points) Find the domain and range of $f(x)$. Briefly explain why your solution is correct.

Solution:

- Domain of $f(x)$: $[-4, 2]$.

- Range of $f(x)$: $[0, 6]$.

Explanation: Look at the graph above.

3. (2 points) Find $f(-2)$. Show your work.

> **Solution:** Let's find an equation for the left segment of the function $f(x)$, i.e. the part that connects points $(-4, 4)$ and $(-1, 0)$. So
>
> $$\text{slope} = \frac{0 - 4}{-1 - (-4)} = -\frac{4}{3}$$
>
> and using slope-point form we get that
>
> $$f(x) = -\frac{4}{3}(x + 4) + 4.$$
>
> Thus
>
> $$f(-2) = -\frac{4}{3}(-2 + 4) + 4 = -\frac{8}{3} + 4 = \frac{-8 + 12}{3} = \boxed{\frac{4}{3}}.$$

4. (3 points) Find the equation of the line through the point $(0, f(0))$ that is perpendicular to the graph $f(x)$.

> **Solution:** Let's find an equation for the right segment of the function $f(x)$, i.e. the part that connects points $(-1, 0)$ and $(2, 6)$. So
>
> $$\text{slope} = \frac{6 - 0}{2 - (-1)} = \frac{6}{3} = 2$$
>
> and using slope-point form we get that
>
> $$f(x) = 2(x - 2) + 6.$$
>
> Thus
>
> $$f(0) = 2(0 - 2) + 6 = -4 + 6 = 2.$$
>
> Recall that the line that is perpendicular to the graph of $f(x)$ has a slope $-\frac{1}{2}$ i.e. negative reciprocal of the original slope m, in our case $m = 2$.
>
> Again using slope-point form we get that
>
> $$g(x) = -\frac{1}{2}(x - 0) + 2 = \boxed{-\frac{1}{2}x + 2}.$$