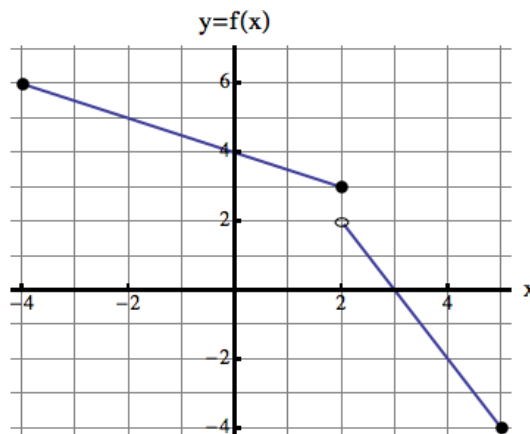**1.** [13 points]   Consider the functions $f(x)$ and $g(x)$, where $g(x) = 2 - \dfrac{1}{2}x$ and the graph of $y = f(x)$ is shown below.

a. [9 points]

i) Compute the value of the following expressions. Write "Undefined" if the value of the expression is not defined or there is not enough information to be computed.

> *Solution:* $2f(-2) + 3f(4) = 2(5) + 3(-2) = \textbf{4}$ $f^{-1}(3) = \textbf{2}$
>
> $\qquad f(g(2)) = f(2 - 0.5(2)) = f(1) = \textbf{3.5}$ $g(g^{-1}(5)) = \textbf{5}$

ii) Find the horizontal and vertical intercepts of the function $y = f(g(x))$.

> *Solution:*
> **Horizontal intercept:** If $f(g(x)) = 0$ then $g(x) = 3$. Hence $2 - \frac{1}{2}x = 3$ then $x = -2$. Hence the horizontal intercept is at **(-2,0)**.
>
> **Vertical intercept:** $y = f(g(0)) = f(2) = 3$. Hence the vertical intercept is at **(0,3)**.

iii) Find the average rate of change of $f(x)$ between $x = 2$ and $x = 5$. Show your work.

> *Solution:*   Average rate of change of $f(x) = \dfrac{f(5) - f(2)}{5 - 2} = \dfrac{-4 - 3}{3} = -\dfrac{7}{3}.$

b. [4 points] Find a piecewise defined formula for $f(x)$.

> *Solution:*
> $$f(x) = \begin{cases} 4 - \dfrac{1}{2}x & -4 \le x \le 2 \\[2mm] -2x + 6 & 2 < x \le 5 \end{cases}$$