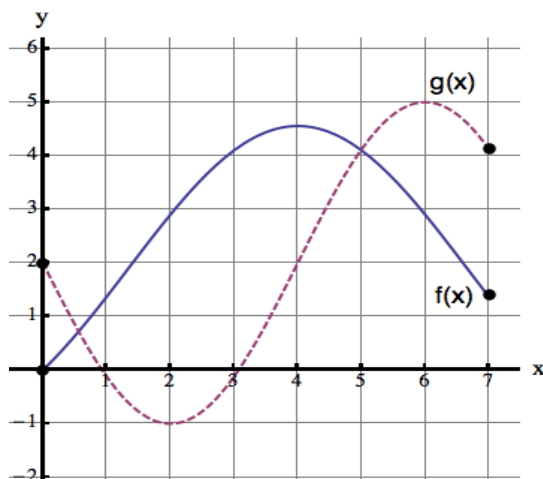


3. [8 points] The graphs of the functions $f(x)$ and $g(x)$ are shown below. The domain of $f(x)$ and $g(x)$ is $0 \leq x \leq 7$.



- a. [4 points]

i) Find the range of $g(x)$. Use interval notation or inequalities in your answer.

Solution: Range = $[-1, 5]$ or $-1 \leq y \leq 5$.

ii) For which values of $0 \leq x \leq 7$ is the function $g(x)$ concave down? Use interval notation or inequalities in your answer.

Solution: $g(x)$ is concave down in $[4, 7]$ or $4 \leq x \leq 7$.

iii) For which values of $0 \leq x \leq 7$ is the function $g(x)$ increasing? Use interval notation or inequalities in your answer.

Solution: $g(x)$ is increasing in $[2, 6]$.

- b. [4 points] Define the functions:

$$D(x) = g(x) - f(x) \quad \text{and} \quad R(x) = \frac{g(x)}{f(x)}.$$

i) For which values of $0 \leq x \leq 7$ is the function $D(x)$ negative? Use interval notation or inequalities in your answer.

Solution: $D(x) < 0$ on $(0.5, 5)$ or $0.5 < x < 5$.

ii) Find the domain of the function $R(x)$. Use interval notation or inequalities in your answer.

Solution: Domain of $R(x)$: $(0, 7]$ or $0 < x \leq 7$.