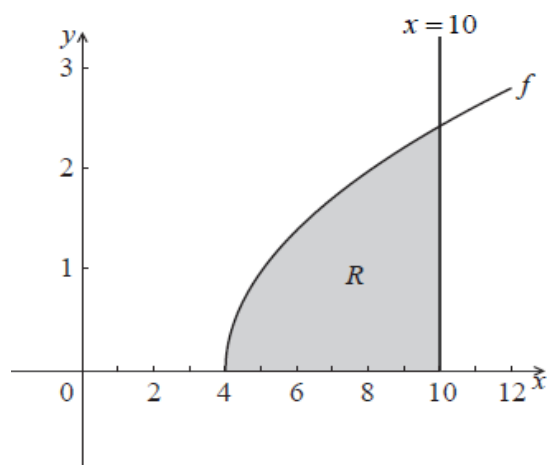**Homework:** Integration as the area under a curve

1a. Consider a function $f(x)$ such that $\int_1^6 f(x)dx = 8$. Find $\int_1^6 2f(x)dx$.   *[2 marks]*

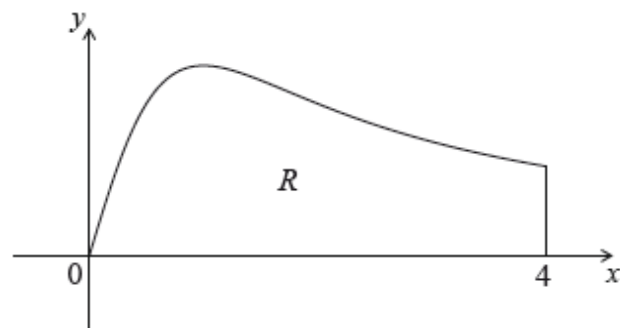**1b.** Find $\int_1^6 (f(x) + 2)\, dx$.   *[4 marks]*

2a. Find $\int_4^{10} (x - 4)dx$.   *[4 marks]*

2b. Part of the graph of $f(x) = \sqrt{x - 4}$, for $x \geq 4$, is shown below. The shaded region R is enclosed by the graph of f, the line $x = 10$, and the x-axis.

Find the area of the shaded region.   *[3 marks]*

3. The following diagram shows the graph of $f(x) = \frac{x}{x^2+1}$, for $0 \leq x \leq 4$, and the line $x = 4$.

Let R be the region enclosed by the graph of f, the x-axis and the line $x = 4$.

Find the area of R.   *[6 marks]*

4a. Let $f(x) = x^2$ and $g(x) = 3\ln(x+1)$, for $x > -1$.

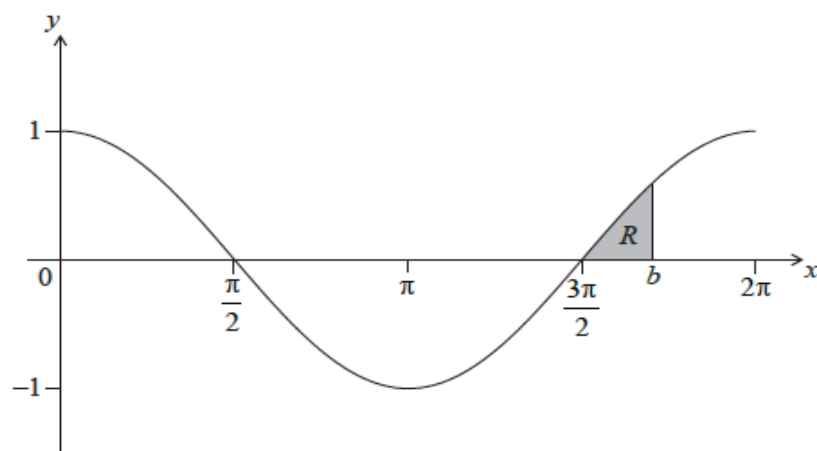Solve $f(x) = g(x)$.   [3 marks]

4b. Find the area of the region enclosed by the graphs of f and g.   [3 marks]

5. Let $f(x) = \cos x$, for $0 \leq x \leq 2\pi$. The following diagram shows the graph of f.

There are x-intercepts at $x = \dfrac{\pi}{2}, \dfrac{3\pi}{2}$.

The shaded region R is enclosed by the graph of f, the line $x = b$, where $b > \dfrac{3\pi}{2}$, and the x-axis. The area of R is $\left(1 - \dfrac{\sqrt{3}}{2}\right)$. Find the value of b.   [8 marks]