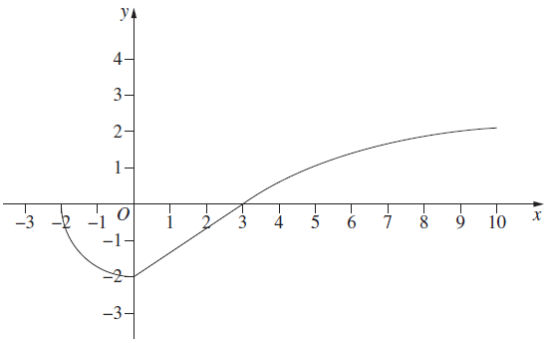
MA SP **18** **Band 2-5**

The diagram shows a continuous function $y = f(x)$ defined in the domain $[-2, 10]$. The function consists of a quarter of a circle centred at (0, 0) with radius 2, a straight line segment and a logarithmic function $f(x) = \ln(x - 2)$ in the domain $[3, 10]$.



(a) Find the exact area bounded by the function $y = f(x)$ and the x-axis in the domain $[-2, 3]$. **2**

(b) Hence, find the exact value of **2**

$$\int_3^{10} \ln(x-2)\,dx, \text{ given that } \int_{-2}^{10} f(x)\,dx = 8\ln 8 - 10 - \pi.$$

(a) Area $= \int_{-2}^{3} \ln(x-2)\,dx$

$=$ Area of quadrant + area of triangle

$= \frac{1}{4} \times \pi \times 2^2 + \frac{1}{2} \times 2 \times 3$

$= \pi + 3 \quad \therefore$ the area is $(\pi + 3)$ units^2.

(b) $\int_{-2}^{10} f(x)\,dx = \int_{-2}^{3} \ln(x-2)\,dx + \int_{3}^{10} \ln(x-2)\,dx$

$$8\ln 8 - 10 - \pi = -(\pi + 3) + \int_3^{10} \ln(x-2)\,dx$$

$$\int_3^{10} \ln(x-2)\,dx = 8\ln 8 - 7$$

* These solutions have been provided by *projectmaths* and are not supplied or endorsed by NESA.