

## 1 | cooling pizza

Compute

$$\int_0^5 -110e^{-0.4t} dt$$

to the nearest degree.

$$\int -110e^{-0.4t} dt = \frac{-110}{-0.4} e^{-0.4t} = 275e^{-0.4t}$$

Using the net change theorem,

$$\begin{aligned} \Delta_\beta \int_0^5 -110e^{-0.4t} dt &= \int -110e^{-0.4(5)} dt - \int -110e^{-0.4(0)} dt \\ &= 275e^{-0.4(5)} - 275e^0 \\ &= 37.21720289 - 275 \\ &= 37.21720289 - 275 \\ &= 300 - 237.78279711 \approx \boxed{62^\circ F} \end{aligned}$$

## 2 | definite integral as area under a curve

The area in the triangle is 3 square units, so  $5 + 3 = \boxed{8}$

## 3 | minimum value of $f(x) = \int_{-2}^{x^2-3x} e^{t^2} dt$

$$\begin{aligned} \frac{d}{dx} f(x) &= e^{(x^2-3x)^2} (2x-3) = 0 \\ \implies 2x-3 &= 0 \\ \implies 2x &= 3 \\ \implies x &= \frac{3}{2} \end{aligned}$$

## 4 | approximate area under the curve graphically

The function looks symmetric about  $x = 12$ , so I will focus on  $[0, 12]$ .

On the interval  $[0, 6]$  a little under  $6 \cdot 100$  barrels of oil flow through.

On the interval  $[6, 12]$  a little over  $6 \cdot 100 + \frac{1}{2} 6 \cdot 100$  barrels flow through, for a total of

$$\approx 2(6 \cdot 100 + 6 \cdot 100 + \frac{1}{2} 6 \cdot 100) = 3000$$

barrels of oil.

## 5 | **fundamental theorem of calculus but worded confusingly**

$F(x)$  is the antiderivative of  $f(x)$ , so differences of its values are definite integrals. In this case,

$$F(3) - F(0) = \int_0^3 f(x)dx = \int_0^1 f(x)dx + \int_1^3 f(x)dx = 2 + 2.3 = \boxed{4.3}$$