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,

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

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 $f(x) = \int_{-2}^{x^2-3x} e^{t^2}dt$

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

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 $\approx 2(6 * 100 + 6 * 100 + \frac{1}{2}6 * 100) = 3000$ barrels of oil.

5 | fundamental theorem of calculus but worded confusingly

$F(x)$ is the antiderivative of $f(x)$, so differences in it are values of definite integrals.