4. $\int_a^b f(x)\,dx$ gives the stated area if $f(x) \geq 0$ and $a \leq b$.

The other possibility is the "opposite": $f(x) \leq 0$, $a \geq b$, as then

$$\int_a^b f(x)\,dx = \int_b^a (-f(x))\,dx,$$ and now

$-f(x) \leq 0$ and the limits of integration are again "from left to right".

5(a) $\int e^x + 2\sin x - \frac{1}{x}\,dx = e^x - 2\cos x - \ln|x| + C$

(b) $\int x(x^2+5)^8\,dx$ could be evaluated by expanding the polynomial, but it is far easier to use substitution:

$u = x^2+5$ (the "inside" of the composition $(x^2+5)^8$)

$$\frac{du}{dx} = 2x \qquad du = 2x\,dx$$
$$\tfrac{1}{2}du = x\,dx$$

$$\int (x^2+5)^8 x\,dx = \int u^8 \tfrac{1}{2}\,du \quad [\text{No } x \text{ left!}]$$

$$= \frac{1}{2}\frac{u^9}{9} + C = \frac{(x^2+5)^9}{18} + C$$

(c) $$\int_1^4 x^2\,dx = \left[\tfrac{1}{3}x^3\right]_1^4 = \tfrac{1}{3}4^3 - \tfrac{1}{3}1^3 = \underline{\underline{21}}.$$