

2.

$$\begin{aligned}
 & \int_1^2 dy \int_0^2 dx (xy + 2y) \\
 &= \int_1^2 dy \left[y \frac{x^2}{2} + 2yx \right]_{x=0}^{x=2} \\
 &= \int_1^2 dy (2y + 4y) = \\
 &= \int_1^2 dy (6y) = \left[6 \frac{y^2}{2} \right]_{y=1}^{y=2} = \\
 &= \left(6 \frac{2^2}{2} - 6 \frac{1^2}{2} \right) = 12 - 3 = 9
 \end{aligned}$$

check:

$$\begin{aligned}
 & \int_0^2 dx \int_1^2 dy (xy + 2y) = \int_0^2 dx \int_1^2 dy (x+2)y \\
 &= \int_0^2 dx \left[(x+2) \frac{y^2}{2} \right]_{y=1}^{y=2} \\
 &= \int_0^2 dx \left\{ (x+2) 2 - (x+2) \frac{1}{2} \right\} \\
 &= \int_0^2 dx (x+2) \frac{3}{2} = \int_0^2 dx \left(\frac{3}{2}x + 3 \right) \\
 &= \left[\frac{3}{2} \frac{x^2}{2} + 3x \right]_{x=0}^{x=2} = \frac{3}{2} 2 + 3(2) - 0 - 0 = 3 + 6 = 9
 \end{aligned}$$

$f(x)$	$\int f(x)$
x	$x^2/2$
ax	$a x^2/2$
yx	$y x^2/2$
$a (= ax^0)$	ax
$2y (= 2yx^0)$	$2yx$
$xy + 2y$	$y x^2/2 + 2yx$

$f(y)$	$\int f(y)$
y	$y^2/2$
ay	$a y^2/2$
xy	$x y^2/2$
$2y$	$2 y^2/2$
$(x+2)y$	$(x+2) y^2/2$