(5) $\int_C x^2y + \sin x \, dy \quad y = x^2 \quad dy = 2x\,dx \quad (0,0) \ (\pi, \pi^2)$

$x \in [0, \pi]$

$= \int_C (x^4 + \sin x)(2x)\,dx = \int_C 2x^5 + 2x\sin x\,dx$

$= \int_0^\pi 2x^5 + 2x\sin x\,dx = \int_0^\pi 2x^5\,dx + \int_0^\pi 2x\sin x\,dx$

$= \frac{2}{6}(\pi)^6 + \int_0^\pi 2x \sin x\,dx$

$2x$	$\sin x\,dx$		$-2x\cos x + 2\sin x \Big]_0^\pi$
2	$-\cos x$	$+$	$-2\pi(-1) + 0 - 0 - 0 = 2\pi$
0	$-\sin x$	$-$	

$= \boxed{\frac{\pi^6}{3} + 2\pi}$

(7) $\int_C (x+2y)\,dx + x^2\,dy \quad (0,0)\ (2,1) \quad (2,1)\ (3,0)$

$y = \frac{1}{2}x \qquad y = 3 - x$

$C_1 \ (0,0) \ (2,1) \qquad r(t) = (1-t)\langle 0,0\rangle + t\langle 2,1\rangle = \langle 2t, t\rangle, t \in [0,1]$

$r'(t) = \langle 2, 1\rangle$

$\int_{C_1} (x+2y)\,dx + x^2\,dy = \int_0^1 (2t + 2(t))(2\,dt) + (2t)^2(1\,dt)$

$= \int_0^1 8t + 4t^2\,dt = 4t^2 + \frac{4}{3}t^3 \Big|_0^1 = \frac{16}{3}$

$C_2 = \langle 3,0\rangle - \langle 2,1\rangle = \langle 1,-1\rangle \quad r(t) = (1-t)\langle 2,1\rangle + t\langle 3,0\rangle = \langle 2+t, 1-t\rangle$

$\int_0^1 (2+t + 2 - 2t)\,dt - (2+t)^2\,dt = \int_0^1 -5t - t^2\,dt = -\frac{5}{2} - \frac{1}{3} = -\frac{17}{6} + \frac{16}{3} = \boxed{\frac{5}{2}}$