The Change of Variables Theorem- HW Problems

Evaluate the following integrals.

1. $\iint_D (x^2 + y^2)^2 dA$; where D is the disk $x^2 + y^2 \leq 9$.

2. $\iint_D (x^2 + y^2)^2 dA$; where D is the annulus $1 \leq x^2 + y^2 \leq 4$.

3. $\iint_D (x^2 + y^2)^2 dA$; where D is the part of the annulus
$1 \leq x^2 + y^2 \leq 4$ where $x \geq 0$.

4. $\iiint_W \left(e^{(x^2+y^2)} + 2z\right) dV$ where W is part of the solid cylinder
$x^2 + y^2 \leq 9$ where $1 \leq z \leq 2$.
Hint: cylindrical coordinates.

5. $\iiint_W \left(\sqrt{x^2 + y^2 + z^2}\right) dV$ where W is the set where
$x^2 + y^2 + z^2 \leq 4$.
Hint: spherical coordinates.

6. $\iiint_W \left(\sqrt{x^2 + y^2 + z^2}\right) dV$ where W is the solid bounded by
$x^2 + y^2 + z^2 = 1$, $x^2 + y^2 + z^2 = 4$,
and $z = 0$, with $z \geq 0$.

7. $\int_0^\infty e^{-9x^2} dx$.

8. Find the volume of the solid that lies inside the sphere $x^2 + y^2 + z^2 = 4$ and outside the cylinder $x^2 + y^2 = 1$.
Hint: cylindrical coordinates.

9. Evaluate $\iiint_W \left(e^{(x^2+y^2+z^2)^{\frac{3}{2}}} \right) dV$ where W is bounded by
$x^2 + y^2 + z^2 = 1$ and $z = \frac{1}{2}$ with $\frac{1}{2} \le z \le 1$.