Find the following integrals and verify your answer by taking the derivative

1. $\int 2x\, e^{x^2}\, dx, \quad$ Let $u = x^2$

2. $\int (x^2 - 2x)\sqrt{x^3 - 3x^2 + 1}\, dx,$
   Let $u = x^3 - 3x^2 + 1$

3. $\int \frac{x}{1 + x^2}\, dx, \quad$ Let $u = 1 + x^2$

4. $\int \frac{1}{x \ln(x)}\, dx, \quad$ Let $u = \ln(x)$

5. $\int \frac{\sin(\sqrt{x})}{\sqrt{x}}\, dx, \quad$ Let $u = \sqrt{x}$

6. $\int \cos(x)\sin(x)\, dx$
   Let $u = \sin(x)$

7. $\int \cos(x)\sin(x)\, dx$
   Let $u = \cos(x)$