Evaluate each integral. Check by differentiating.

1. $\displaystyle\int \sin^{-1}(x)\ dx$

2. $\displaystyle\int x^2 \sin^{-1}(5x^3 - 4)\ dx$

3. (*) $\displaystyle\int_1^{\sqrt[4]{3}} x\tan^{-1}(x^2)\ dx$

4. (**) $\displaystyle\int e^x \cos 2x\ dx$

   Hint: use parts twice and solve for the integral.

5. (**) $\displaystyle\int x^4 \cos(3x)\ dx$

   Hint: Try the tabular ("tic-tac-toe") method for doing parts multiple times.