1. *Write the first couple steps for these integrals: DO NOT SOLVE ALL THE WAY!*

   (a) $\int \frac{dx}{x^3+x^2}$

   Factor and then use partial fractions.

   (b) $\int \frac{x+7}{x^2+6x+13}dx.$

   Complete the square. Use the trig-substitution $x+3=2\tan\theta$.

   (c) $\int \cos\sqrt{x+\pi^2}dx.$

   Let $u=\sqrt{x+\pi^2}$. The integral becomes $\int 2u\cos u du$..

   (d) $\int \tan^5\theta\sec\theta d\theta.$

   Expand $\tan^5\theta\sec\theta = \tan^4\theta\tan\theta\sec\theta = (\sec^2\theta-1)^2\tan\theta\sec\theta$ and then use $u=\sec\theta$. The integral becomes $\int (u^2-1)^2 du$.

   (e) $\int \sin^5\theta\cos^3\theta d\theta.$

   Write $\cos^2\theta = (1-\sin^2\theta)$ and then make u-sub with $u=\sin\theta$. The integral becomes $\int u^5(1-u^2)du$ - cakewalk from here.

   (f) $\int \frac{x}{(x^2+2x-3)^{3/2}}dx.$

   Complete the square and make the substitution $x+1=2\sec\theta$. Split into two integrals. You should get $\frac{1}{4}[-2\cot\theta-\csc\theta]$, then use a reference triangle.

   (g) $\int_0^\infty x^3e^{-x^2}dx.$

   First use the substitution $t=x^2$. This makes the integral into

$$= \frac{1}{2}\int_0^\infty te^{-t}du.$$

   Hit this with an integration by parts with $u=t$ and $dv=e^{-t}dt$.

   (h) $\int \frac{x^3+2}{x^2-1}dx.$

   Use polynomial division then use partial fractions.

   (i) $\int \frac{\sin x\cos x}{\sin^4 x+\cos^4 x}dx$

   $u=\sin^2 x$ and write $\cos^2 x = 1-\sin^2 x$ then complete the square and use trig sub.