Below are some principles and/or integration rules you will need for the Integration Proficiency.

1. Integration Rules

   (a) $n \neq -1$, $\int x^n \, dx =$

   (b) $\int \frac{1}{x} \, dx =$

   (c) $\int \sin(x) \, dx =$

   (d) $\int \cos(x) \, dx =$

   (e) $\int \sec^2(x) \, dx =$

   (f) $\int \sec(x)\tan(x) \, dx =$

   (g) $\int e^x \, dx =$

   (h) $\int \frac{1}{1+x^2} \, dx =$

   (i) $\int \frac{1}{\sqrt{1-x^2}} \, dx =$

2. Each of the following attempts at integration is WRONG. Identify the error and then work the problem correctly.

   (a) $\int \frac{3x^2 - 2x}{x^{1/2}} \, dx = \frac{x^3 - x^2}{(2/3)x^{3/2}} + C$

   (b) $\int (x-1)(2x+1) \, dx = \left(\frac{x^2}{2} - x\right)(x^2 + x) + C$

(c)

$$\int (x+2x\sin(x^2+1))dx = \int (u+\sin(u))du = \frac{1}{2}u^2 - \cos(u) + C = \frac{1}{2}(x^2+1)^2 - \cos(x^2+1) + C$$

Let $u = x^2 + 1$
$du = (2x)dx$