BASIC INTEGRATION FORMULAS:

- $\displaystyle\int du = \int 1\, du = u + C$
- $\displaystyle\int u^p\, du = \frac{1}{p+1}\, u^{p+1} + C, \quad p \neq -1$
- $\displaystyle\int \sin(u)\, du = -\cos(u) + C$
- $\displaystyle\int \cos(u)\, du = \sin(u) + C$
- $\displaystyle\int \csc(u)\cot(u)\, du = -\csc(u) + C$
- $\displaystyle\int \sec(u)\tan(u)\, du = \sec(u) + C$
- $\displaystyle\int \csc^2(u)\, du = -\cot(u) + C$
- $\displaystyle\int \sec^2(u)\, du = \tan(u) + C$
- $\displaystyle\int \frac{1}{u}\, du = \ln|u| + C$
- $\displaystyle\int e^u\, du = e^u + C$

RECALL: If $a > 0$:

- $\displaystyle\int \frac{1}{\sqrt{a^2 - u^2}}\, du = \arcsin\left(\frac{u}{a}\right) + C = \sin^{-1}\left(\frac{u}{a}\right) + C$
- $\displaystyle\int \frac{1}{u^2 + a^2}\, du = \frac{1}{a}\arctan\left(\frac{u}{a}\right) + C = \frac{1}{a}\tan^{-1}\left(\frac{u}{a}\right) + C$
- $\displaystyle\int \frac{1}{u\sqrt{u^2 - a^2}}\, du = \frac{1}{a}\operatorname{arcsec}\left(\frac{|u|}{a}\right) + C = \frac{1}{a}\sec^{-1}\left(\frac{|u|}{a}\right) + C$

BASIC STRATEGIES:

- 'Separate' numerators and simplify: $\displaystyle\frac{3-x}{2x^4} = \frac{3}{2x^4} - \frac{x}{2x^4} = \frac{3}{2}\, x^{-4} - \frac{1}{2}\, x^{-3}$
- Rewrite radicals as powers: $\sqrt[4]{2x-1} = (2x-1)^{\frac{1}{4}}$, $\displaystyle\frac{3}{\sqrt{4-x}} = 3\,(4-x)^{-\frac{1}{2}}$
- Let u be what's in parentheses.
- Let u be what's in the exponent.
- Let u be what's in the denominator.
- Complete the square: $6x - x^2 = -\left(x^2 - 6x\right) = -\left(x^2 - 6x + 9\right) + 9 = 9 - (x-3)^2$
- If the integrand is a rational function where the degree of the numerator is equal to or greater than the degree of the denominator, try long division:

$$\frac{x^2}{2x+3} = \frac{1}{2}\,x - \frac{3}{4} + \frac{9}{4\,(2x+3)}$$