# STRATEGIES for Evaluating INTEGRALS - **Prof. Richard B. Goldstein**

| Integral | Strategies | simplified form |
|---|---|---|
| $\int \frac{x^2+\sqrt{x}+1}{x}\,dx$ | algebraic simplification | $\int x + x^{-1/2} + \frac{1}{x}\,dx$ |
| $\int \sin(4x)\cos(3x)dx$ | trigonometric identity | $\int \frac{1}{2}\left[\sin(4-3)x+\sin(4+3)x\right]dx$ |
| $\int \frac{2x+5}{x-3}dx$ | algebraic simplification<br><br>substitution | $\int\left(2+\frac{11}{x-3}\right)dx$, then let u = x -3 |
| $\int x^2\sin(2x)\,dx$ | integration by parts<br>repeat twice | let $u = x^2$<br>let dv = sin(2x) dx |
| $\int \sin^4 x\cos^5 x\;dx$ | substitution | let u = sin(x), then du = cos(x) dx<br>and $\cos^4 x = (1 - u^2)^2$ |
| $\int \frac{2x^2-x+4}{x^3+4x}dx$ | partial fractions | $\int\left(\frac{1}{x}+\frac{x}{x^2+4}-\frac{1}{x^2+4}\right)dx$ |
| $\int \frac{x^3-x^2}{(x-6)(5x+3)^3}dx$ | partial fractions | $\int\left(\frac{A}{x-6}+\frac{B}{5x+3}+\frac{C}{(5x+3)^2}+\frac{D}{(5x+3)^3}\right)dx$ |
| $\int \frac{1}{x-\sqrt{x+2}}dx$ | substitution<br><br>partial fractions | let $u=\sqrt{x+2}$ ► $\int \frac{2u}{u^2-u-2}du$<br>$=\int\left(\frac{4/3}{u-2}+\frac{2/3}{u+1}\right)du$ |
| $\int \frac{dx}{\sqrt{5-4x-x^2}}$ | complete the square<br><br>substitution | $\int \frac{dx}{\sqrt{9-(x+2)^2}}$, then let u = x + 2 |
| $\int \frac{dx}{\sqrt{x}-\sqrt[3]{x}}$ | rational substitution | let $u=\sqrt[6]{x}$ or $x=u^6$ ► $\int \frac{6u^5}{u^3-u^2}du$<br>$=6\int\left(u^2+u+1+\frac{1}{u-1}\right)du$ |