Calculus II (Maths 201–NYB)

Answers

1. $\int x \ln(x)\, dx$

   Parts: $u = \ln(x), dv = x\, dx$, giving $\int x \ln(x)\, dx = \frac{1}{2}x^2 \ln(x) - \frac{1}{4}x^2 + C$.

2. $\int \dfrac{x^2+2}{x\sqrt{x^2-1}}\, dx$

   Split in two, giving $\int \frac{x^2+2}{x\sqrt{x^2-1}}\, dx = \sqrt{x^2-1} + 2\,\mathrm{arcsec}\, x + C$

3. $\int x\sqrt{1-x}\, dx$

   Two ways to do this: (1) by back-substitution: $u = 1-x, du = -dx$, and $x = 1-u$, giving $\int x\sqrt{1-x}\, dx = -\frac{2}{3}(1-x)^{3/2} + \frac{2}{5}(1-x)^{5/2} + C$.
   Also (2) by parts:
   $u = x, dv = (1-x)^{1/2}\, dx$, giving $\int x\sqrt{1-x}\, dx = -\frac{2}{3}x(1-x)^{3/2} - \frac{4}{15}(1-x)^{5/2} + C$.

4. $\int \dfrac{1}{x^2}\sqrt{1+\dfrac{1}{x}}\, dx$

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