Antidifferentiation Practice

We can write the general antiderivative of $f(x)$ as $F(x) = \int f(x)\,dx$ (note that there are no upper or lower bounds). Here's some practice finding antiderivatives. For some problems, we need to use some algebra first.

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

2. $\displaystyle\int (\sqrt{x^3} + \sqrt[3]{x^2})\,dx = \int x^{3/2} + x^{2/3}\,dx = \frac{2}{5}x^{5/2} + \frac{3}{5}x^{5/3} + C$

3. $\displaystyle\int \left(x^3 + \frac{1}{4}x^2 + 2 + \frac{1}{x}\right)\,dx = \frac{1}{4}x^4 + \frac{1}{12}x^3 + 2x + \ln(x) + C$

4. $\displaystyle\int x(x^2+1)\,dx = \int x^3 + x\,dx = \frac{1}{4}x^4 + \frac{1}{2}x^2 + C$

5. $\displaystyle\int \sin(x) + \cos(x)\,dx = -\cos(x) + \sin(x) + C$

6. $\displaystyle\int \frac{8}{\sqrt{1-x^2}}\,dx = 8\sin^{-1}(x) + C$

7. $\displaystyle\int x^e + e^x\,dx = \frac{1}{e+1}x^{e+1} + \mathrm{e}^x + C$

8. $\displaystyle\int \frac{1}{x^2} - \frac{4}{x^3}\,dx = \int x^{-2} - 4x^{-3}\,dx = -x^{-1} + 2x^{-2} + C$

9. $\displaystyle\int \frac{\sqrt{y} - y}{y^2}\,dy = \int y^{-3/2} - \frac{1}{y}\,dy = -2y^{-1/2} - \ln(y) + C$

10. $\displaystyle\int x^2 + 1 + \frac{1}{x^2+1}\,dx = \frac{1}{3}x^3 + x + \arctan(x) + C$