3. $f(x) = \frac{1}{2} + \frac{3}{4}x^2 - \frac{4}{5}x^3 \quad \Rightarrow \quad F(x) = \frac{1}{2}x + \frac{3}{4}\frac{x^{2+1}}{2+1} - \frac{4}{5}\frac{x^{3+1}}{3+1} + C = \frac{1}{2}x + \frac{1}{4}x^3 - \frac{1}{5}x^4 + C$

Check: $F'(x) = \frac{1}{2} + \frac{1}{4}(3x^2) - \frac{1}{5}(4x^3) + 0 = \frac{1}{2} + \frac{3}{4}x^2 - \frac{4}{5}x^3 = f(x)$

4. $f(x) = 8x^9 - 3x^6 + 12x^3 \quad \Rightarrow \quad F(x) = 8\left(\frac{1}{10}x^{10}\right) - 3\left(\frac{1}{7}x^7\right) + 12\left(\frac{1}{4}x^4\right) + C = \frac{4}{5}x^{10} - \frac{3}{7}x^7 + 3x^4 + C$

15. $g(\theta) = \cos\theta - 5\sin\theta \quad \Rightarrow \quad G(\theta) = \sin\theta - 5(-\cos\theta) + C = \sin\theta + 5\cos\theta + C$

16. $f(t) = \sin t + 2\sinh t \quad \Rightarrow \quad F(t) = -\cos t + 2\cosh t + C$

19. $f(x) = \dfrac{x^5 - x^3 + 2x}{x^4} = x - \dfrac{1}{x} + \dfrac{2}{x^3} = x - \dfrac{1}{x} + 2x^{-3} \quad \Rightarrow$

$F(x) = \dfrac{x^2}{2} - \ln|x| + 2\left(\dfrac{x^{-3+1}}{-3+1}\right) + C = \frac{1}{2}x^2 - \ln|x| - \dfrac{1}{x^2} + C$

20. $f(x) = \dfrac{2+x^2}{1+x^2} = \dfrac{1+(1+x^2)}{1+x^2} = \dfrac{1}{1+x^2} + 1 \quad \Rightarrow \quad F(x) = \tan^{-1}x + x + C$

31. $f'(x) = \sqrt{x}(6+5x) = 6x^{1/2} + 5x^{3/2} \quad \Rightarrow \quad f(x) = 4x^{3/2} + 2x^{5/2} + C.$

$f(1) = 6 + C$ and $f(1) = 10 \quad \Rightarrow \quad C = 4$, so $f(x) = 4x^{3/2} + 2x^{5/2} + 4.$

32. $f'(x) = 2x - 3/x^4 = 2x - 3x^{-4} \quad \Rightarrow \quad f(x) = x^2 + x^{-3} + C$ because we're given that $x > 0$.

$f(1) = 2 + C$ and $f(1) = 3 \quad \Rightarrow \quad C = 1$, so $f(x) = x^2 + 1/x^3 + 1.$