Extra practice: Basic antiderivatives

For answers, either plug into WolframAlpha.com, and/or take a derivative again to see if you get the original function.

Problem A. Power rule.

1. $\int x^7 \, dx$
2. $\int x^{-7} \, dx$
3. $\int x^{-1} \, dx$
4. $\int x^{5/3} \, dx$
5. $\int x^{-5/4} \, dx$
6. $\int \sqrt[3]{x^2} \, dx$
7. $\int \frac{1}{\sqrt[4]{x^3}} \, dx$
8. $\int \frac{2}{x^2} \, dx$
9. $\int (8 - x + 2x^3 - 6/x^3 + 2x^{-5} + 5x^{-1}) \, dx$
10. $\int (2 - 5x)(3 + 2x)(1 - x) \, dx$
11. $\int \sqrt{x}(ax^2 + bx + c) \, dx$
12. $\int (x^2 - 1/x^2)^3 \, dx$
13. $\int (\sqrt{x} - 1/\sqrt{x}) \, dx$
14. $\int \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)^2 \, dx$
15. $\int \frac{(1 + 2x)^3}{x^4} \, dx$
16. $\int \frac{(1 + x)^3}{\sqrt{x}} \, dx$
17. $\int \frac{2x^2 + x - 2}{x - 2} \, dx$
18. If $\frac{df}{dx} = x - 1/x^2$ and $f(1) = 1/2$ find $f(x)$.

Problem B. Trigonometric functions.

1. $\int \left(9 \sin x - 7 \cos x - \frac{6}{\cos^2 x} + \frac{2}{\sin^2 x} + \cot^2 x\right) \, dx$
2. $\int \left(\frac{\cot x}{\sin x} - \tan^2 x - \frac{\tan x}{\cos x} + \frac{2}{\cos^2 x}\right) \, dx$
3. $\int \sec x(\sec x + \tan x) \, dx$
4. $\int \csc x(\csc x - \cot x) \, dx$
5. $\int (\tan x + \cot x)^2 \, dx$
6. $\int \frac{1 + 2 \sin x}{\cos^2 x} \, dx$
7. $\int \frac{3 \cos x + 4}{\sin^2 x} \, dx$
8. $\int \frac{1}{1 - \cos x} \, dx$
   [hint: mult and divide by $(1 + \cos(x))$ and rewrite using $\csc(x)$, etc.]
9. $\int \frac{1}{1 + \cos x} \, dx$

10. $\displaystyle\int \frac{\tan x}{\sec x + \tan x}\, dx$

11. $\displaystyle\int \frac{\csc x}{\csc x - \cot x}\, dx$

12. $\displaystyle\int \frac{\cos x}{1 + \cos x}\, dx$

13. $\displaystyle\int \frac{\sin x}{1 - \sin x}\, dx$

14. $\displaystyle\int \sqrt{1 + \cos 2x}\, dx$

15. $\displaystyle\int \sqrt{1 - \cos 2x}\, dx$

16. $\displaystyle\int \frac{1}{1 + \cos 2x}\, dx$

17. $\displaystyle\int \frac{1}{1 - \cos 2x}\, dx$

18. $\displaystyle\int \sqrt{1 + \sin 2x}\, dx$

19. $\displaystyle\int \frac{\sin^3 x + \cos^3 x}{\sin^2 x \cos^2 x}\, dx$

Problem C. Exponential functions and inverse functions.

1. $\displaystyle\int 2^x\, dx$

2. $\displaystyle\int (6x^5 - 2x^{-4} - 7x + 3/x - 5 + 4e^x + 7^x)\, dx$

3. $\displaystyle\int (x/a + a/x + x^a + a^x + ax)\, dx$

4. $\displaystyle\int \left(\sqrt{x} - \sqrt[3]{x^4} + \frac{7}{\sqrt[3]{x^2}} - 6e^x + 1\right)\, dx$

5. $\displaystyle\int \left(1 + \frac{1}{1+x^2} - \frac{2}{\sqrt{1-x^2}} + \frac{5}{x\sqrt{x^2-1}} + a^x\right)\, dx$

6. $\displaystyle\int \frac{x^2}{1+x^2}\, dx$
[hint: add and subtract 1 in the numerator]

7. $\displaystyle\int \frac{x^2 - 1}{x^2 + 1}\, dx$

8. $\displaystyle\int \frac{x^6 - 1}{x^2 + 1}\, dx$

9. $\displaystyle\int \frac{x^4}{1+x^2}\, dx$

10. $\displaystyle\int \cos^{-1}(\sin x)\, dx$