Evaluate each of the following integrals. For each integral, write down the integration technique you ended up using, and why you chose it. There are hints for a few of these on the next page. Remember that you can always check your answer by differentiating it!

1. $\displaystyle\int \frac{\ln(t^2)}{t}\,dt$
2. $\displaystyle\int xe^{2x}\,dx$
3. $\displaystyle\int \cos^3 x\ \sin x\,dx$
4. $\displaystyle\int_0^{\pi} x\sin(2x)\,dx$
5. $\displaystyle\int \cos^2 x\ \sin^3 x\,dx$
6. $\displaystyle\int_3^4 \frac{1}{2y+1}\,dy$
7. $\displaystyle\int_1^2 \frac{e^{\frac{1}{x}}}{x^2}\,dx$
8. $\displaystyle\int \frac{1}{\sqrt{1-x^2}}\,dx$
9. $\displaystyle\int \frac{1}{x^2+1}\,dx$
10. $\displaystyle\int_1^4 \frac{\cos\left(\sqrt{x}\right)}{\sqrt{x}}\,dx$
11. $\displaystyle\int \tan^2 x\,dx$
12. $\displaystyle\int_0^1 e^{-2x}\,dx$
13. $\displaystyle\int (\ln x)^2\,dx$
14. $\displaystyle\int \frac{x}{x+1}\,dx$
15. $\displaystyle\int \frac{x^2}{1+x}\,dx$
16. $\displaystyle\int \tan^2 p\ \sec^2 p\,dp$
17. $\displaystyle\int_2^{10} \frac{1}{\sqrt{5x-1}}\,dx$
18. $\displaystyle\int_0^1 \arcsin t\,dt$
19. $\displaystyle\int \frac{1}{\sqrt{x}(1+\sqrt{x})}\,dx$
20. $\displaystyle\int \frac{1}{1+9r^2}\,dr$
21. $\displaystyle\int \cos^2 x\,dx$
22. $\displaystyle\int \frac{\sec^2 x}{\sqrt{\tan x}}\,dx$
23. $\displaystyle\int \cot x\,dx = \int \frac{\cos x}{\sin x}\,dx$
24. $\displaystyle\int \frac{2x}{\sqrt{1-x^4}}\,dx$

Hints

1. Algebra first!
5. $\sin^3 x = \sin^2 x \cdot \sin x$, and $\sin^2 x + \cos^2 x = 1$.
8. and 9. These are easy!
11. Look up a trig identity involving $\tan^2 x$ in the trig worksheets!
16. What is the derivative of $\tan x$?
20. Compare to Q9.
21. $\cos 2x = \cos^2 x - \sin^2 x = \cos^2 x - (1 - \cos^2 x) = 2\cos^2 x - 1$
24. Compare to Q8.