Math 221 Keys and Hints for HW1

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17. $\int_0^{\sqrt{\ln 2}} 2xe^{x^2}\mathrm{d}x$
Ans: 1.
Hint: Noticing that $2x$ is the derivative of x^2 and the remaining part is a function of x^2, we can use the substitution $u = x^2$ to get the antiderivative.
22. $\int \frac{2^{\ln x}}{x}\mathrm{d}x$
Ans: $\frac{2^{\ln x}}{\ln 2} + C$
Hint: Noticing that $1/x$ is the derivative of $\ln x$, we can let $u = \ln x$
29. $\int \frac{2s}{\sqrt{1-s^4}}\mathrm{d}s$
Ans: $\arcsin(s^2) + C$
Hint: $u = s^2$
37. $\int_1^2 \frac{8}{x^2-2x+2}\mathrm{d}x$
Ans: 2π
Hint: Completing the square, we have $(x-1)^2 + 1$ in the denominator, so the antiderivative is $8\arctan(x-1) + C$.
48. $\int \frac{x^2}{x^2+1}\mathrm{d}x$
Ans: $x - \arctan x + C$
Hint: Reducing the improper fraction, we have $1 - \frac{1}{1+x^2}$.
58. $\int \frac{1}{1+\cos x}\mathrm{d}x$
Ans: $-\cot x + \frac{1}{\sin x} + C$ Or equivalently, $\tan(\frac{x}{2}) + C$
Hint: For the first, multiply $1 - \cos x$ on the top and the bottom. You can also write $\frac{1}{\sin x}$ as $\csc x$, but I don't like csc. The second answer comes from that $1 + \cos x = 2\cos^2(\frac{x}{2})$ and $u = x/2$.
77. $\int \frac{6}{\sqrt{y}(1+y)}\mathrm{d}x$
Ans: $12\arctan(\sqrt{y}) + C$
Hint: Notice that $\frac{1}{\sqrt{y}}$ is the derivative of $2\sqrt{y}$, so $u = \sqrt{y}$.