Math 152-37, Mr. Church, Homework 13 (part A)

Due in class on Wednesday, November 26.

Please staple your homework.

(If you think there is any chance you may not be in class on Wednesday, you should leave your homework in the mailbox labeled "Church" in the basement of Eckhart by Tuesday evening.)

1. Define two functions $s(x)$ and $c(x)$ by $s(x) = \dfrac{e^x - e^{-x}}{2}$ and $c(x) = \dfrac{e^x + e^{-x}}{2}$. Calculate $s'(x)$ and $c'(x)$. Can you relate these derivatives to the original functions $s(x)$ and $c(x)$?
2. Check that the identity $[c(x)]^2 - [s(x)]^2 = 1$ for all x.
3. Exercise 7.6.6.
4. Exercise 7.6.18.
5. (a) Show that $\cos(\arcsin(x)) = \sqrt{1-x^2}$. (Hint: write $y = \arcsin x$ and rewrite in terms of y.)
   (b) Use the formula for the derivative of an inverse function to show that $\dfrac{d}{dx}\arcsin(x) = \dfrac{1}{\sqrt{1-x^2}}$.
6. Look at the table (7.7.12) on page 384.

Math 152-37, Mr. Church, Homework 13 (part B)

Due in class on Monday, December 1.

Please staple your homework.

1. With $s(x)$ and $c(x)$ as above, check that $c(a+b) = c(a)c(b) + s(a)s(b)$. [Hint: first, write out both sides.]

There is a similar formula for $s(x)$, namely $s(a+b) = s(a)c(b) + c(a)s(b)$, but you don't have to prove it.

2. Define $t(x) = \dfrac{s(x)}{c(x)}$. Prove that $t'(x) = \dfrac{1}{[c(x)]^2}$. (You can use any of the above identities.)
3. Exercise 7.4.48.
4. Exercise 7.4.50.
5. Exercise 7.4.58. (Note that in part (b), you just need to write down the integral but do not need to evaluate it.)