

Homework 7 Hints

I tend to hear questions on the following parts of Homework 7. I hope that these hints help.

1. **20.7** Don't worry about the new function names and don't worry if you can't find them in your calculator. Use the definition to compute values.

$$\cosh(x) = \frac{e^x + e^{-x}}{2} \text{ and } \sinh(x) = \frac{e^x - e^{-x}}{2}.$$

For examples, $\cosh(2/3) = \frac{e^{2/3} + e^{-2/3}}{2} \approx 1.23057558$.

- (a) PART A: Plug in values $x = -2, -1, 0, 1, 2$, connect the dots and draw the graphs. You should compare these to the graphs of $y = e^x$ and $y = e^{-x}$.
- (b) PART B: You are being asked to verify $[\cosh(x)]^2 - [\sinh(x)]^2 = 1$. That is, you are being asked to simplify the following and show that it is equal to 1.

$$[\cosh(x)]^2 - [\sinh(x)]^2 = \left(\frac{e^x + e^{-x}}{2}\right)^2 - \left(\frac{e^x - e^{-x}}{2}\right)^2 = \frac{1}{4}(e^x + e^{-x})^2 - \frac{1}{4}(e^x - e^{-x})^2$$

Foil the expressions out and simplify (some terms should cancel and you should end up with 1). The intermediate steps are what we are looking for.

- (c) PART C: The following function is given $y = 500 \cosh\left(\frac{x}{500}\right) + C$. You are also told that $y = 100$ when $x = 200$. Use this information to find C . Then find the height when $x = 0$ to answer the question.
2. **21.2** There is sometimes confusion about what is given.
 - (a) PART A: You are asked to find the model $I(d) = I_0 b^d$ where I_0 is the intensity of light at the surface and d is the depth. The intensity I_0 is not given, but you are told that the intensity decreases **by** 15 percent every 3 feet. So when $x = 3$ the intensity is 15 percent less than I_0 , so $I(3)$ is 85 percent of I_0 . Put $0.85I_0$ and 3 in the right places and find b .
 - (b) PART B: A decrease **to** 1 percent is the same as multiplying I_0 by 0.01.
 3. **21.9** PART B: Start with $v(x) = ax^2 + bx + c$, plug in the given values to get 3 equations $v(0) = 55000$, $v(10) = 75000$, and $v(15) = 120000$. Combine the equation to find a , b , and c . This is a little tedious, but it is doable and it gives you some more practice at combining equations.