MATH 211: 9-11 WORKSHEET

(1) Use integration to derive the formula that the circumference of a circle is $2\pi r$, where r is the radius.

[Hint 1: It's enough to do this for the unit circle, since scaling a circle by r will scale all linear distances by r. You can think of a circle as two copies of a semi-circle, and the unit semicircle can be modeled as a function $c(x) = \sqrt{1 - x^2}$.]

[Hint 2: The integral you get here is one you can find an explicit antiderivative for. But you might need to remember some of the more obscure basic rules for derivatives.]

(2) Determine the arc length of one full period of $y = \sin x$. If you can't find an explicit antiderivative, use a computer to approximate it.

(3) Determine the arc length of the curve $x = e^y$ from $y = 0$ to $y = 2$. If you can't find an explicit antiderivative, use a computer to approximate it.