Part I (due at the beginning of class Thursday, November 6)

We briefly mentioned inverse trigonometric functions in class Tuesday. Let's see if we can find the derivative of $\arcsin x$. First, we let $y = \arcsin x$. Then, taking the sine of both sides, we get $\sin y = x$. From this point, we want to find $\dfrac{dy}{dx}$, so use implicit differentiation to do that. Our goal is to find the derivative of y without any y's involved (i.e., in terms of x only), so see what you can do to make that happen. It might be helpful to draw a right triangle and label it with things you know based on the fact that $\sin y = x$ (so make y one angle of the triangle and see if you can label the sides).

Part II: Problems (due at the beginning of class Tuesday, November 12)

1. Given $g(5) = -3$, $g'(5) = 6$, $h(5) = 3$, and $h'(5) = -2$, find $f'(5)$ for each of the following, if possible. If not possible, explain what additional information you need in order to be able to find the requested value.

   (a) $f(x) = g(x)h(x)$

   (b) $f(x) = g(h(x))$

   (c) $f(x) = \dfrac{h(x)}{g(x)}$

   (d) $f(x) = h(g(x))$

   (e) $f(x) = (g(x))^3$

   (f) $f(x) = \sin(g(x))$

2. In class, we proved the Power Rule for derivative for natural numbers using the Binomial Theorem to expand $(x + h)^n$ in the limit definition of the derivative. Now we'll prove the Power Rule in two other cases.

   (a) For the case of a negative integer exponent, write $f(x) = x^{-n}$, where n is a natural number, as a quotient and apply the Quotient Rule to find the derivative $f'(x)$ (you can use the Power Rule for positive integer exponents along the way).

   (b) For the case of a rational exponent, write $y = x^{\frac{p}{q}}$, where p and q are integers and $q \neq 0$. Then do some algebra to get rid of the fraction in the exponent and use implicit differentiation to find $\dfrac{dy}{dx}$ (you can use the Power Rule for integer exponents along the way). Remember that we want $\dfrac{dy}{dx}$ in its final version to be only in terms of x.

Self Evaluation #2 (due Thursday, November 14)

This self evaluation is a place for you to think about the course and your own work in the course in a more holistic manner than just doing a problem set. As such, please write about your learning in this class and reflect on your learning in light of the following statements inspired by practices encouraged in mathematics. Where have you seen yourself growing in relation to these practices in this class, and where do you hope to continue to grow throughout the rest of the semester?

1. I can write clear solutions to mathematical problems.
2. I can work effectively with others, listening to their ideas and giving and accepting constructive feedback.
3. I can reflect on my own learning and identify strengths and weaknesses in my understanding.
4. I can persevere in solving problems.
5. I can make connections among mathematical thinking in calculus, Christian faith, and problems in the world.

When you turn in your reflection, also make an appointment for a conversation with me about it during the week of November 18–22. Note that if you want to meet on Monday, you'll need to turn in your completed evaluation at least an hour before we meet.