

Assignment 6

To be done on a **separate** piece of paper! Please **do not** cram all of your answers onto this worksheet!

Due **Friday 10/24/14** in class.

You **must show your work** to receive credit. You should *check* your answers online.

1. Find and simplify the derivative of the following functions.

(a) $y = \sqrt{1 - x^2} \arcsin(x)$

(c) $f(t) = \arctan\left(\frac{3}{t}\right)$

(b) $y = 2 \ln((x - 2)^2) + \ln(x)^2$

(d) $g(x) = \frac{1}{\ln(\sin(x))}$

2. The function $f(x) = \sinh(x)$ is one-to-one. Find and simplify the derivative of $f^{-1}(x)$. *Hint:* to simplify $\cosh(\sinh^{-1}(x))$, plug $u = \sinh^{-1}(x)$ into the identity $\cosh^2(u) - \sinh^2(u) = 1$.

3. Find $\frac{dy}{dx}$ using implicit differentiation.

(a) $\arctan(x^2y) = xy^2$

(b) $\frac{4y^2x}{1 - y^2} = a$

4. The speed of sound in dry air is a function of the temperature, given by

$$c(T) = 331.3 \sqrt{1 + \frac{T}{273.15}}.$$

Here c is in meters per second, and T is in degrees Celsius. Find a linear function that approximates the speed of sound for temperatures near 0°C .

5. Consider the function $f(x) = -(x - 2)^2 + 4$

- (a) Find the value of c guaranteed by the Mean Value Theorem on the interval $[-1, 4]$.
- (b) Find equation of the tangent line at this point.

6. Find and classify the critical points of $f(x) = x^5 + 15x^4 + 25$.

7. Use the graph of the derivative f' shown below to find and classify the critical points of f .

