1. Find the derivative and second derivative of the following

(a) $g(x) = \frac{1+\sec(x)}{1-\sec(x)}$

(b) $h(x) = \sin^2 x$

2. Suppose that an object moves back and forth according to the function

$$f(t) = t^3 + bt^2 + ct + d, \quad f(0) = 1,\ f'(0) = 0,\ \text{and}\ f''(0) = 3.$$

(a) Using the information above find $f(t)$.

(b) When is the object at rest?

(c) When is the object moving forward? Moving backward?

(d) When is the object accelerating?

(e) How far did the object travel (counting retraces!) between $t = 0$ and $t = 8$?

3. Suppose $f(u) = \cos(u)$ and $g(t) = 3t^4$. Using chain rule, compute:

(a) $(f \circ g)'(t)$

(b) $(g \circ f)'(u)$

(c) $(g \circ g)'(t)$

(d) $(f \circ f)'(u)$

4. Given that f and g are both differential functions find the derivative of the following

(a) $((f \cdot g) \circ f)(t)$

(b) $\left(f \circ \left(\frac{f}{g}\right)\right)(x)$