Problem 1. Let \( h(x) = \sqrt{7 + \sin(x)} \).

1. Find functions \( f \) and \( g \) such that \( h = f \circ g \).
2. Compute \( f' \).
3. Compute \( f' \circ g \).
4. Compute \( g' \).
5. Use the Chain Rule to compute \( h' \).

Problem 2. Let \( h(x) = \cos(x^2) \).

1. Find functions \( f \) and \( g \) such that \( h = f \circ g \).
2. Compute \( f' \).
3. Compute \( f' \circ g \).
4. Compute \( g' \).
5. Use the Chain Rule to compute \( h' \).

Problem 3. Given that \( f(x) = (x^{5/2} - 4x^{1/3} + 365)^{42} \), compute \( f' \).

Problem 4. If \( y = (\cos(x^2))^2 \), compute \( y' \).

Problem 5. Let \( y = \left(\frac{1 - x^2}{1 + x^2}\right)^{10} \) and compute \( y' \) using the Chain Rule first and then the Quotient Rule. Check your answer by rewriting \( y = \frac{(1 - x^2)^{10}}{(1 + x^2)^{10}} \) and computing \( y' \) using the Quotient Rule first and then the Chain Rule.

Problem 6. Find a function \( f \) with derivative \( f'(x) = 5x + 3 \).

Problem 7. Find the equation of the tangent line to the curve \( y = (x + 1/x)^3 \) at the point where \( x = -1 \). Graph the curve and the line.

Problem 8. Assume \( a, b, c \) and \( d \) are real numbers and \( f(w) = a(\cos(wb))^2 + c(\sin(wd))^2 \). Compute \( f' \).

Problem 9. Find the real number \( m \) such that \( y = m \cos(2t) \) satisfies the differential equation \( y'' + 5y = 3 \cos(2t) \).

Problem 10. Given that \( f'(x) = \sqrt{2x + 3} \), \( g(x) = x^2 + 2 \), and \( F(x) = f(g(x)) \), compute \( F' \).

\(^1\)Taken from Calculus I, II, III: A Problem-Based Approach with Early Transcendentals; Mahavier < Allen, Browning, Daniel, & So.