

Homework 7

§3.5#11, 25, 29, 31, 41, 54, Extra, **32, 56**

§3.6#5, 15, 23, 25, 33, 43, **66, 70***

§3.5 #11. Find the derivative of $g(t) = (2 + \sin(\pi t))^3$

§3.5 #25. Find the derivative of $f(x) = 2x \sin(3x)$

§3.5 #29. Find the derivative of $y = \sin^5(\theta)$

§3.5 #31. Find the derivative of $z = \tan(e^{-3\theta})$

§3.5 #41. Find the derivative of $P = \frac{\cos(t)}{t^3}$

§3.5 #54. Let $f(x) = \sin^2(x) + \cos^2(x)$.

a) Find $f'(x)$ using the formula for $f(x)$ and derivatives of trigonometric functions. Simplify your answer.

b) Find $f'(x)$ by first using a trigonometric identity to simplify and then taking the derivative.

Extra. Find $\frac{d}{d\theta} \sec^3(\theta)$

§3.5 #32. Find the derivative of the function $w = e^{-\sin(\theta)}$.

§3.5 #56. The depth, y , in feet, of water in Boston harbor is given in terms of t , the number of hours since midnight, by

$$y = 5 + 4.9 \cos\left(\frac{\pi}{6}t\right)$$

(a) Find $\frac{dy}{dt}$. What does $\frac{dy}{dt}$ represent, in terms of water level?

(b) For $0 \leq t \leq 24$, when is $\frac{dy}{dt}$ zero? Explain what it means (in terms of water level) for $\frac{dy}{dt}$ to be zero.

§3.6 #5. Find the derivative of $y = \arcsin(x + 1)$

§3.6 #15. Find the derivative of $j(x) = \ln(e^{ax} + b)$ where a and b are constants

§3.6 #23. Find the derivative of $s(x) = \arctan(2 - x)$

§3.6 #25. Find the derivative of $g(t) = e^{\arctan(3t^2)}$

§3.6 #33. Find the derivative of $f(z) = \frac{1}{\ln(z)}$

§3.6 #43. On what intervals is $\ln(x^2 + 1)$ concave up?

§3.6 #66. As a particular location, $f(p)$ is the number of gallons of gas sold per day when the price is p dollars per gallon.

- a) What does the statement $f(2) = 4023$ tell you about gas sales?
- b) Find and interpret $f^{-1}(4023)$
- c) What does the statement $f'(2) = -1250$ tell you about gas sales?
- d) Find and interpret $(f^{-1})'(4023)$

§3.6 #70*. If f is increasing and $f(20) = 10$, which of the two options, a) or b), must be wrong?

a) $f'(10)(f^{-1})'(20) = 2$

b) $f'(20)(f^{-1})'(10) = 2$