

1. (8 points) Identify the domains of the following functions:

(a) (2 points) $g(t) = \frac{2t+6}{(t-2)(t+4)}$

(b) (3 points) $h(x) = \sqrt{1-x^2}$

(c) (3 points) $f(\theta) = \frac{1}{\sin \theta}$

2. (8 points) Let $f(x)$ be a linear function passing through $(3, 4)$ and $(5, 10)$.

(a) (4 points) Give a formula for $f(x)$.

(b) (4 points) Algebraically compute and simplify the difference quotient $\frac{f(a+h)-f(a)}{h}$.

3. **(8 points)** A water boiler equipped with a thermostat raises water temperature to 210°F , then allows it to cool to 180°F , then heats it back up again, and so forth. 30 minutes pass between consecutive times when the water is 210°F . We will attempt to model the temperature with a function $f(t)$ built from a trigonometric function.
- (a) **(3 points)** What is the range of $f(t)$? Taking $f(t)$ as a sinusoidal function, what amplitude and vertical shift should it have?
- (b) **(1 point)** What is the period of $f(t)$?
- (c) **(4 points)** Construct a function $f(t)$ satisfying the above-determined range and period properties.
4. **(1 point bonus)** Explain why, given that $f(x)$ and $g(x)$ are odd functions, the function $h(x) = f(x) \cdot g(x)$ must always be even.