

Show all work.

1. **(7 points)** Identify the domains of the following functions:

(a) **(3 points)** $h(t) = \ln(25 - x^2)$

(b) **(4 points)** $f(x) = \frac{\sqrt{4-x}}{x^2-8x}$

2. **(6 points)** Below, let $f(x) = 2x^2 - 3x + 1$ and $g(x) = 8x^3 + 1$.

(a) **(2 points)** Find formulas for $f(g(x))$ and $g(f(x))$. You do not need to simplify.

(b) **(4 points)** Find a formula for $g^{-1}(x)$.

3. **(7 points)** This is the record of the first 5 seconds of a runner's performance in a race:

Time elapsed (in seconds)	0.00	1.00	2.00	3.00	4.00	5.00
Distance traveled (in meters)	0.00	1.00	5.00	8.50	13.00	17.00

(a) **(2 points)** What is the runner's average speed in the first two seconds of the race?

(b) **(2 points)** What is the runner's average speed between the times $t = 1$ and $t = 4$?

(c) **(3 points)** The detailed records indicate that 2.99 seconds into the race, they had progressed 8.46 meters. Based on this information, what would be a good estimate for the instantaneous speed after 3 seconds?

4. **(2 point bonus)** If $f(x)$ is increasing over its entire domain and $g(x)$ is decreasing over its entire domain, what (if anything) can be said about $f(f(x))$, $f(g(x))$, $g(f(x))$, and $g(g(x))$? Justify your claims on the back of this paper.