

(1) [5] Let $H(x) = \csc^3(\sqrt{x})$. Find functions f , g and h so that $H = f \circ g \circ h$.

$$h(x) = \sqrt{x}$$

$$g(x) = \csc(x)$$

$$f(x) = x^3$$

(2) [5] Let $f(x) = 3 + x$ and $g(x) = 9 - x^2$. Determine and simplify $\left(\frac{f}{g}\right)(x)$ and state the domain.

$$\left(\frac{f}{g}\right)(x) = \frac{3+x}{9-x^2} = \frac{3+x}{(3-x)(3+x)} = \boxed{\frac{1}{3-x}}$$

Domain of $f(x) : (-\infty, \infty)$

Domain of $g(x) : (-\infty, \infty)$

$g(x) = 0$ at $x = 3, -3$.

\therefore Domain of $\left(\frac{f}{g}\right)(x) : \boxed{(-\infty, -3) \cup (-3, 3) \cup (3, \infty)}$

(3) [5] A stone is dropped into a lake, creating a circular ripple which travels outward at a speed of 40 cm/s. Determine $A(t)$, the area of the circle as a function of time t . (Hint: first determine $r(t)$, the radius of the circle as a function of time.)

$$r(t) = 40t$$

$$A = \pi r^2$$

$$\begin{aligned}\therefore A(t) &= \pi [r(t)]^2 \\ &= \pi [40t]^2 \\ &= 1600\pi t^2\end{aligned}$$