

You own a company producing iSquids, (the latest portable electronic craze). Your big production limitation is a scarcity of Chip 187, produced by outside manufacturers.

If  $f(x)$  is the profit your company will make if it gets  $x$  Chip 187's and  $g(x)$  is a function giving the number of Chip 187's you can obtain for  $x$  dollars, which of the following is of interest to you?

**(a)**  $f \circ g$

**(b)**  $g \circ f$

**(c)** both

**(d)** neither

$$f(x) = x + \frac{1}{x} \quad g(x) = \frac{x + 8}{x + 2} \quad h(x) = \sqrt{x}$$

Express each function as an equation.

What is the domain of each function?

$$(f \circ g)(x)$$

$$(h \circ f)(x)$$

$$g(f(x))$$

$$(g \circ h)(x)$$

$$(g \circ g)(x)$$

$$h(h(x))$$

For each of the following functions, first express it as a composition of 2 functions. Then find the derivatives.

**a)**  $F(x) = \sqrt[3]{1 + 5x}$

**d)**  $H(x) = \cos(3^7 + x^7)$

**b)**  $G(x) = (x^4 + 9x^2 + 3)^8$

**e)**  $G(x) = \left(\frac{x^2 + 8}{x^2 - 8}\right)^3$

**c)**  $F(t) = \sqrt[9]{1 + \tan(t)}$

**f)**  $S(z) = \sqrt{\frac{z - 7}{z + 7}}$

Find the derivatives.

a)  $y = \frac{r}{\sqrt{r^2 + 3}}$

b)  $y = x \sin\left(\frac{7}{x}\right)$

c)  $f(t) = \sqrt{\frac{t}{t^2 + 1}}$

d)  $g(y) = \frac{(y - 2)^6}{(y^2 + 4y)^9}$

e)  $y = \sin(\tan(8x))$

f)  $y = \cos(\cos(\cos(x)))$

g)  $y = (1 + \sec(3\pi x + 4\pi))^5$

h)  $y = \sqrt{11x + \sqrt{11x + \sqrt{11x}}}$

i)  $y = [x + (x + \sin(2x))^6]^7$

If  $h(x) = \sqrt{7 + 6f(x)}$ , where

$$f(4) = 7 \text{ and } f'(4) = 2,$$

find  $h'(4)$ .

Find the first and second derivatives of  $y = \sin(x^2)$ .

If  $f$  and  $g$  are both differentiable and  $h = f \circ g$ ,  $h'(2)$  equals

- ❶  $f'(2) \circ g'(2)$
- ❷  $f'(2)g'(2)$
- ❸  $f'(g(2))g'(2)$
- ❹  $f'(g(x))g'(2)$