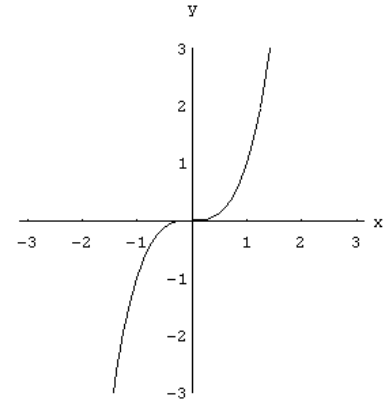
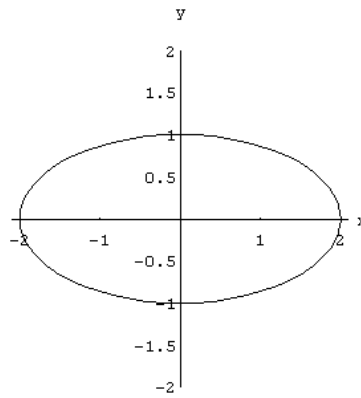
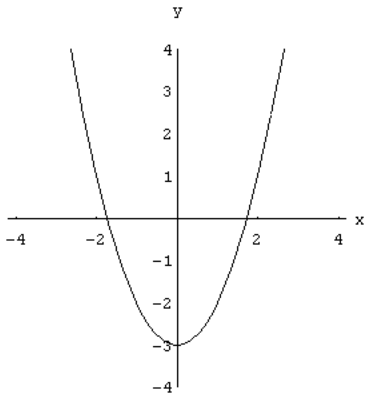


## COMPOSITION OF FUNCTIONS / INVERSE RELATIONS / INVERSE FUNCTIONS

In the following problems, assume the domain is as large as possible unless the question says otherwise.

- 1) If  $f(x) = 2x + 1$ ,  $g(x) = x - 2$  and  $h(x) = 3 - x$ , find the composite functions:  
a)  $g \circ f$  b)  $f \circ g$  c)  $f \circ f$  d)  $f \circ h$  e)  $h \circ g$
- 2) Ex 4.16 p 188 qu 1
- 3) If  $g(a) = 1 - a$  and  $h(a) = 1 - a^2$ , find:  
a)  $g \circ h(-3)$  b)  $h \circ g(-3)$
- 4) At 10.00 am, the radius of a spherical balloon is 80 cm and is decreasing at a rate of 5 cm per minute.  
a) Write the volume of the balloon as a function of  $T$  where  $T$  is the number of seconds which have elapsed since 10.00 am.  
b) What is the volume of the balloon 2 minutes and 10 seconds after 10.00 am?
- 5) If  $p(m) = m^2$  and  $q(m) = \sqrt{9 - m}$ , what is largest possible domain of  
a)  $q \circ p$  b)  $p \circ q$  ?
- 6) If  $f(x) = x + 1$ ,  $g(x) = x^2 - 1$  and  $h(x) = x - 1$ , find  $f \circ g \circ h$ .
- 7) What type is the inverse relation of a:  
a) **1 : 1** relation b) **n : 1** relation c) **1 : n** relation d) **n : n** relation ?
- 8) a) What type is the relation  $\{(3,4),(5,-2),(3,1),(7,4),(-1,8),(0,1)\}$ ?  
b) What is the inverse relation?  
c) What type is the inverse relation?
- 9) a) What type is the following relation?
- |     |   |   |    |    |    |    |   |
|-----|---|---|----|----|----|----|---|
| $x$ | 4 | 3 | 0  | -5 | 2  | -2 | 1 |
| $y$ | 2 | 0 | -5 | 0  | -2 | -5 | 3 |
- b) What is the inverse relation?  
c) What type is the inverse relation?
- 10) Find the equations of the inverses of the following relations:  
a)  $y = 2x - 1$  b)  $y = x^2 - 1$  c)  $y^2 = 2x - 1$  d)  $x^2 + y^2 = 25$  e)  $4x^2 + y^2 = 25$   
State whether or not each inverse is a function.
- 11) Find the equations of the inverses of the following functions:  
a)  $f(x) = x + 3$  b)  $f(x) = \frac{1}{x + 3}$  c)  $f(x) = (x + 3)^2$  d)  $f(x) = \frac{x - 1}{x + 3}$  e)  $f(x) = \sqrt{\frac{1}{2}x - 1}$   
State whether or not each inverse is a function.
- 12) Find the inverse function  $f^{-1}$  if it exists of:  
a)  $f(x) = 2x + 3$  b)  $f(x) = \frac{2}{x - 3}$  c)  $f(x) = x^2 + 2x$  d)  $f(x) = (x - 4)^3$  e)  $f(x) = \sqrt[3]{x - 6}$

13) Sketch the graphs of the inverses of the following relations:



14) If the function  $g$  has an inverse  $g^{-1}$ , what is the value of :

a)  $g \circ g^{-1}(t)$    b)  $g^{-1} \circ g(t)$  ?

15) The domain of the function  $f(x) = 4x^2$  is  $x \geq 0$ .

Show that the function is **1 : 1**. What is the inverse function?

16) The domain of the function  $f(x) = 4x^2$  is  $x \leq 0$ .

Show that the function is **1 : 1**. What is the inverse function?

**ANSWERS**

1) a)  $2x-2$    b)  $2x-3$    c)  $4x+3$    d)  $7-2x$    e)  $5-x$

3) a) 9   b) -15

4)  $\frac{4}{3}\pi(80-\frac{1}{12}T)^3 \text{ cm}^3$    1386051  $\text{ cm}^3$

5) a)  $-3 \leq m \leq 3$    b)  $m < 9$

6)  $x^2 - 2x + 1$

7) a) **1 : 1**   b) **1 : n**   c) **n : 1**   d) **n : n**

8) a) **n : n**   b)  $\{(4,3), (-2,5), (1,3), (4,7), (8,-1), (1,0)\}$    c) **n : n**

9) a) **n : 1**   c) **1 : n**

$x$	2	0	-5	0	-2	-5	3
$y$	4	3	0	-5	2	-2	1

10) a)  $x = 2y - 1$     $y = \frac{1}{2}x + \frac{1}{2}$  function   b)  $x = y^2 - 1$     $y = \pm\sqrt{x+1}$  not a function

c)  $x^2 = 2y - 1$     $y = \frac{1}{2}x^2 + \frac{1}{2}$  function   d)  $x^2 + y^2 = 25$     $y = \pm\sqrt{25-x^2}$  not a function

e)  $4y^2 + x^2 = 25$     $y = \pm\frac{1}{2}\sqrt{25-x^2}$  not a function

11) a)  $x = y + 3$     $y = x - 3$  function   b)  $x = \frac{1}{y+3}$     $y = \frac{1}{x} - 3$  function

c)  $x = (y+3)^2$     $y = \pm\sqrt{x} - 3$  not a function   d)  $x = \frac{y-1}{y+3}$     $y = \frac{1+3x}{1-x}$  function

e)  $x = \sqrt{\frac{1}{2}y-1}$     $y = 2x^2 + 2$  function

12) a)  $x = 2y + 3$     $f^{-1}(x) = \frac{1}{2}x - \frac{3}{2}$    b)  $x = \frac{2}{y-3}$     $f^{-1}(x) = \frac{2}{x} + 3$    c) no inverse function

d)  $x = (y-4)^3$     $f^{-1}(x) = \sqrt[3]{x} + 4$    e)  $x = \sqrt[3]{y-6}$     $f^{-1}(x) = x^3 + 6$

13) reflect in the line  $y = x$

14) a)  $t$    b)  $t$

15)  $x = 4y^2$     $f^{-1}(x) = \frac{1}{2}\sqrt{x}$

16)  $x = 4y^2$   $f^{-1}(x) = -\frac{1}{2}\sqrt{x}$