

## Composite Functions – Day 2

$$y = a(x - \alpha)(x - \beta)$$
$$f(x) \cdot g(x)$$

Example:

If  $g(f(x)) = 2x^2 + 16x - 3$ , find  $g(x)$  and  $f(x)$ .

→ put  $g(f(x))$  in vertex form

$$y = a(x - h)^2 + k$$

complete the square

$$g(f(x)) = (2x^2 + 16x) - 3$$

$$= 2(x^2 + 8x + 16) - 3 - 2(16)$$

$$= 2(x + 4)^2 - 3 - 32$$

$$g(f(x)) = 2(x + 4)^2 - 35$$

let  $f(x) = x + 4$

$$g(f(x)) = 2(f(x))^2 - 35 \rightarrow \text{replace } f(x) \text{ with } x$$

$$g(x) = 2x^2 - 35$$

$$g(f(x)) = (5x+1)^2 + 2(5x+1) - 13$$

→ look for repetition  $5x+1$

→ assign repetition to  $f(x)$

$$f(x) = 5x+1$$

What is  $f(x)$

$g(x)$

→ replace repetition with  $f(x)$

$$g(f(x)) = (f(x))^2 + 2(f(x)) - 13$$

→ replace  $f(x)$  with  $x$

$$g(x) = x^2 + 2x - 13$$

### Your Turn

If  $h(x) = f(g(x))$ , determine  $f(x)$  and  $g(x)$ .

$$h(x) = \sqrt[3]{x} + \frac{3}{3 + \sqrt[3]{x}}$$

$$f(g(x)) = \sqrt[3]{x} + \frac{3}{3 + \sqrt[3]{x}}$$

→ look for repeated term(s) :  $\sqrt[3]{x}$

→ assign the repeated term(s) as a function :  $g(x) = \sqrt[3]{x}$

$$f(g(x)) = g(x) + \frac{3}{3 + g(x)}$$

→ replace  $g(x)$  with  $x$  to find  $f(x)$

$$f(x) = x + \frac{3}{3 + x}$$

**Your Turn**

A spherical weather balloon is being blown up. The balloon's radius,  $r$ , in feet, after  $t$  minutes have elapsed is given by  $r = \sqrt{t}$ .

- Express the surface area of the balloon as a function of time,  $t$ .
- After how many minutes will the surface area be  $180 \text{ ft}^2$ ?

$$SA = 4\pi r^2$$

$$S(r) = 4\pi r^2$$

we know radius is  
a function of time

$$r(t) = \sqrt{t}$$

$$S(r(t)) = 4\pi (\sqrt{t})^2$$

$$S(r(t)) = 4\pi t$$

$$B) SA = 180 \therefore S(r(t)) = 180$$

$$\frac{180}{4\pi} = \frac{4\pi t}{4\pi}$$

$$14.32 \text{ min} = t$$

HW: pg 507 #9,10,14, 15, 17, 18, 20, 21, 23, C2