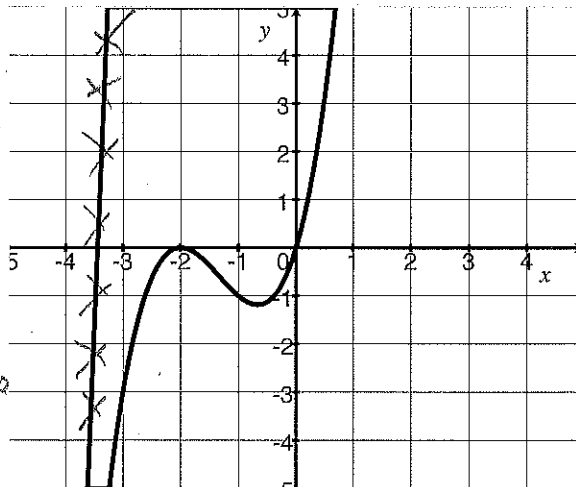


# Quiz 3

Key

Show *all* your work. No credit is given without reasonable supporting work. There are *two* sides to this quiz.

1. [3] (Poly Sheet #4) The function  $f$  graphed below is a third degree polynomial. Find the equation for the graph.



2.1) Polynomial (1.5) degree 3 (1.5)

-2 is a root  $\Rightarrow (x-2)$  is a factor

0 is a root  $\Rightarrow (x-0)$  is a factor

1.5) @  $x = -2$  touches but does not cross  $\Rightarrow (x-2)^2$

@  $x = 0$  crosses  $\Rightarrow (x-0)^1$

1.5) So  $y = a(x-2)^2(x-0)$

$= a(x+2)^2 \cdot x$

passes thru  $(-1, -1)$  so

$$-1 = a(-1+2)^2(-1)$$

$$-1 = a(-1)$$

$$\Rightarrow a = 1$$

$$y = (x+2)^2 x$$

2. [3] (ExpSheet #3) Solve for  $x$  given that  $(x-1)^{-1} = \left(\frac{2}{3}\right)^2 x^{-1}$

$$(x-1)^{-1} = \left(\frac{2}{3}\right)^2 x^{-1}$$

$$\frac{1}{x-1} = \left(\frac{2}{3}\right)^2 \frac{1}{x}$$

neg exp (+1)  
square (+5)  
order of op (+1)  
clear den/factors (+5)

~~$$x + \left(\frac{1}{x-1} = \frac{4}{9x}\right) x - 1$$~~

~~$$9x \left(1 = \frac{4(x-1)}{9x}\right) 9x$$~~

$$9x = 4(x-1)$$

$$9x = 4x - 4$$

$$-4x = -4$$

$$5x = -4$$

$$x = -\frac{4}{5}$$

3. [1] (WebHW7 #18) Write the logarithmic equation below as an exponential equation to solve for  $x$ .

$$\log_b(a) = x \Leftrightarrow b^x = a$$

So  $2^3 = x$   
 $\Rightarrow x = 8$

$$\log_2(x) = 3$$

or

exponentiate both sides  
 $2^{\log_2(x)} = 2^3$   
 $x = 2^3$   
 $x = 8$

4. [3] (§3.1#54) Let  $g$  be the exponential graph that has been vertically shifted. Find the equation for the graph.

exp (1.5)  
 vert shift (1.5)

note  $y = b^x$  passes thru  $(0, 1)$   
 but this passes thru  $(0, -1)$   
 $\Rightarrow$  vertical shift down 2 units

$$\Rightarrow g(x) = b^x - 2$$

use pt (1.5)

passes thru  $(-1, 1)$  so

(1.5)  
 $1 = b^{-1} - 2$

$$3 = b^{-1}$$

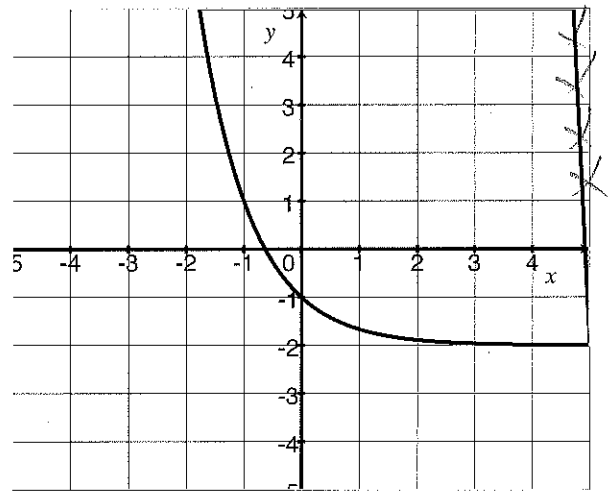
$$3 = \frac{1}{b}$$

$$b3 = 1$$

$$b = \frac{1}{3}$$

(1.5) alg/side

So  
 $g(x) = \left(\frac{1}{3}\right)^x - 2$



or Since we know there is a vert. shift  $g$  is of the form

$$y = b^x + v$$

thru  $(0, -1)$  so

$$-1 = b^0 + v \Rightarrow -1 = 1 + v$$

$$\Rightarrow v = -2 \quad (1.5)$$

So  $y = b^x - 2$

thru  $(-1, 1)$  so

$$1 = b^{-1} - 2 \quad \text{repeat calc shown on left}$$

$$\Rightarrow g(x) = \left(\frac{1}{3}\right)^x - 2$$