

Math 102-001 Winter 2015 Quiz #4

1. Given a graph of the function $y = f(x)$, describe in your own words (be precise!) how you would obtain the graph of [4 marks]

a) $y = 2f(x) - 1$

STRETCH $f(x)$ VERTICALLY BY A FACTOR OF 2.

SHIFT $f(x)$ DOWN 1 UNIT.

b) $y = 2 - f(x)$

FLIP $f(x)$ VERTICALLY.

SHIFT $f(x)$ UP 2 UNITS.

2.

[6 marks]

- a) Write as a single exponential:

$$\frac{3^{x-2} \cdot 9}{\sqrt{2^{4x}} \cdot 2^{-x}}$$

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

- b) Write as a single logarithm:

$$3 \ln(x) - \ln(x+1)$$

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

- c) Use the exponent laws to solve for x:

$$\left(\frac{1}{3}\right)^{3x} = \left(\frac{1}{9}\right)^{1-x}$$

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

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

$$\Rightarrow 3x = 2 - 2x$$

$$\text{IE } x = \frac{2}{5}$$

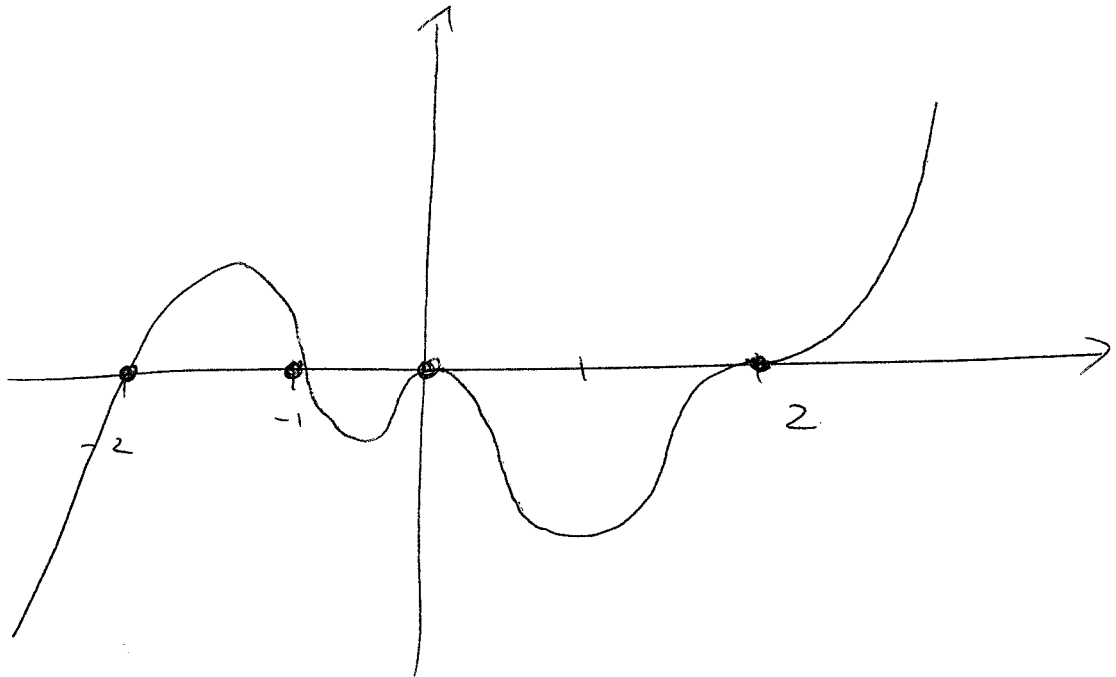
3. Consider the *partially* factored polynomial function $f(x) = x^2(x-2)^2(x+1)(x^2-4)$ [6 marks]

a) Find and classify (single, double,...) all roots of the polynomial.

$$\begin{aligned} f(x) &= x^2(x-2)^2(x+1)(x+2)(x-2) \\ &= x^2(x-2)^3(x+1)(x+2) \end{aligned}$$

ROOTS: $x=0$ (DOUBLE), $x=2$ (TRIPLE),
 $x=-1$ AND $x=-2$ (SINGLE)

b) Use this information to sketch a graph of the function.



4. Use long division (or synthetic division, if you prefer) to divide [4 marks]

$$(x^3 + x^2 - 5x - 2) \div (x - 2)$$

$$\begin{array}{r} x^2 + 3x + 1 \\ (x-2) \overline{) x^3 + x^2 - 5x - 2} \\ \underline{x^3 - 2x^2} \\ 3x^2 \\ \underline{3x^2 - 6x} \\ x - 2 \end{array}$$

THE RESULT IS $x^2 + 3x + 1$.