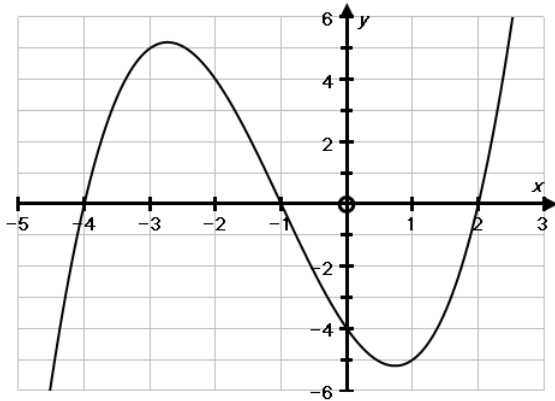


# MATH HONORS 2: SEMESTER 1 REVIEW

1) Write the equation of the polynomial graphed below in standard form:



2) Find the quotient and remainder of  $(k^3 - 2k^2 - 22k + 40) \div (k - 4)$

3) Given  $P(x) = x^3 - 2x^2 + 78 - 35x$ :

- Use synthetic division to show  $x = 1$  is not a zero of  $P(x)$
- Use the factor/remainder theorem to show  $x = -6$  is a zero of  $P(x)$
- Find all other zeros.

4) If  $(x - 3)$  is a factor of  $x^3 - 5x^2 - kx + 24$ , find  $k$

5) Write down the equations of the asymptotes of  $f(x) = \frac{4x^2}{2x^2 - 4x - 6}$

6) Solve  $\frac{3x}{2x-5} = \frac{2x}{2x+5} - \frac{50}{4x^2-25}$

7) Solve:  $\frac{2}{b-2} + \frac{b}{b+4} = \frac{24}{b^2+2b-8}$

8) Solve  $\frac{2z}{z+2} < \frac{z}{z-3} + \frac{9}{z^2-z-6}$

9) Simplify  $\frac{x}{3+\frac{5}{x}} - \frac{4}{1+\frac{2}{x}}$

10) Simplify  $\frac{c}{c^2+4c+3} - \frac{4}{c^2-4c-5} + \frac{2c}{c+1}$

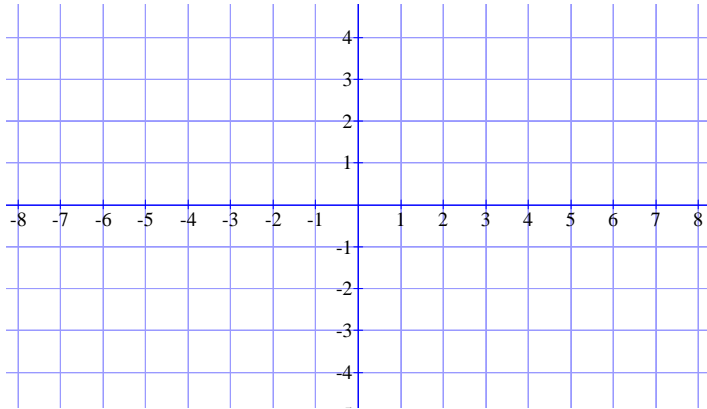
11) Given that  $\frac{Ax+B}{x+3} + \frac{Cx}{2x-1} = \frac{5x^2+22x-7}{2x^2+5x-3}$ , find the values of  $A$ ,  $B$ , and  $C$ .

12) The weight of an object varies inversely as the square of the distance from the object to the center of the Earth whose radius is approximately 4000 miles. If an astronaut weighs 80 kg on Earth, what will the astronaut weigh at a point 60 miles above the Earth's surface?

13) List the transformations needed to transform the graph of  $f(x) = 2^x$  into the graph of  $g(x) = 2^{x-5} - 3$ .

14) Given the function  $f(x) = \frac{x^2 - 4x}{x^3 - x^2 - 20x}$ :

- Write down equations of any asymptotes and coordinates of any intercepts and holes in the graph.
- Write down the domain of the function.
- Write down the range of the function.
- Make a sketch of  $f(x)$ , including the information from above.



15) Solve for  $x$  (by graphing) if  $8^{2x-3} = 16^{2-x}$ .

16) Solve  $10x - 3x^2 \geq -8$ , showing all of your work.

17) For the function  $g(x) = \sqrt{43}x^2 - 9.32 + \frac{2}{7}x$ , find the vertex, the  $x$ -intercepts, and the  $y$ -intercept. Show your work by sketching a graph of the function.

18) How many solutions does  $5 = -2x^2 - 3x + 7$  have? Use the discriminant to explain.

19) For the quadratic function  $f : x \rightarrow 2x^2 + 4x - 30$ , without using a calculator,

- state the equation of the axis of symmetry
- find the coordinates of the vertex
- write the equation in the form  $y = a(x-h)^2 + k$  (if you do not complete the square to do this, try completing the square as a way of checking your work).
- write the equation in the form  $y = a(x-p)(x-q)$

20) Solve for  $x$ :      a)  $\frac{6}{x} = 8 - 2x$       b)  $3(x-5)^2 + 7 = 55$

21) Write an equation for the quadratic whose graph cuts the  $x$ -axis at 3, passes through the point  $(2, -14)$ , and has axis of symmetry  $x = -1$ .

22) Expand and simplify:  $(2 - ai)^3$

23) Evaluate:  $\frac{4 - 3i}{5 + 6i}$

24) Solve  $3x^2 - 2x = -7$  by using the quadratic formula. Show all work.

25) Find the domain and range of the function:  $f(x) = \sqrt{3x-1} - 3$ .

26) Find the equation of the quadratic function  $y = x^2 + 2x$  if it has been stretched horizontally by a factor of  $\frac{1}{3}$ , shifted up 4 units, and reflected around the  $x$ -axis.

27) Find  $f^{-1}(x)$  when  $f(x) = x^2 + 2x$ .

28) If  $f(x) = 2x + 1$  and  $g(x) = 2 - x$ , find

- a)  $(g \circ f)(-4)$
- b)  $(f \circ g)(x^2 + 3)$
- c)  $f^{-1}(2)$

29) Solve for  $x$  and  $y$ :  $2x + 5y = 28$   
 $x - 2y = 2$

30) Solve for  $x$ :  $\frac{2x+1}{2x-6} - \frac{x+4}{x-2} = \frac{1}{2}$

31) Classify each as a function or not a function. Also circle whether each has an inverse function or does not have an inverse function.

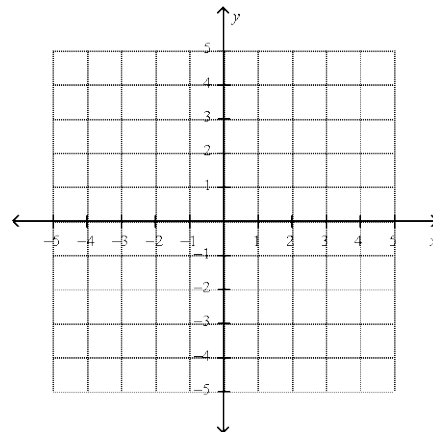
- |                         |                           |                      |
|-------------------------|---------------------------|----------------------|
| a) $f(x) = 5x + 3$      | Function / Not a function | Inverse / No inverse |
| b) $g : x \mapsto 4x^2$ | Function / Not a function | Inverse / No inverse |

32)  $f(x) = \frac{2x-2}{3x}$ . Find  $f^{-1}(x)$ .

33) Write an equation (in the form  $y = a(x-h)(x-k)$ ) for the quadratic function whose graph has x-intercepts of -1 and 4, and passes through the point (5, -18).

34) If  $g(x) = ax^2 + bx + c$ ,  $g(0) = 3$ ,  $g(-3) = 27$ , and  $g(4) = -1$ , find the values of  $a$ ,  $b$ , and  $c$ .

35) On the axes at right, graph:  $f(x) = \begin{cases} x + 2 & \text{if } -3 < x \leq 1 \\ x - 3 & \text{if } x > 1 \end{cases}$



36) If  $h(x) = 4x^2 - 16$ , find two functions  $f$  and  $g$  such that  $f \circ g = h$ .

37) Write an equation for the function shown here:

