SHARP

Worksheet 10 – Functions: Hyperbolas, Parabolas and Exponential Graphs

Grade 10 – Mathematics

1. Sketch the following graphs and then for each question say how each graph changed:

a) $y = \frac{2}{x}$ and $y = \frac{-2}{x}$

b) $y = \frac{2}{x}$ and $y = \frac{2}{x} + 1$

c) $y = x^2$ and $y = 3x^2$

d) $y = x^2$ and $y = \frac{1}{3}x^2$

e) $y = x^2 + 2$ and $y = x^2 - 2$

f) $y = \frac{1}{2}x^2$ and $y = 2x^2$

g) $y = 2^x$ and $y = -2^x$

h) $y = 2^x + 1$ and $y = 2^x - 1$

i) $y = 3^x$ and $y = \left(\frac{1}{3}\right)^x$

j) $y = \frac{3}{x}$ and $y = \frac{5}{x}$

2. Give the equations of the asymptotes for the following graphs:

a) $y = \frac{2}{x}$

b) $y = \frac{2}{x} + 1$

c) $y = x^2$

d) $y = -\frac{2}{x}$

e) $y = 2^x$

f) $y = \frac{3}{x} - 3$

g) $y = 3^x + 1$

h) $y = \left(\frac{1}{3}\right)^x$

i) $y = \frac{3}{x} + 2$

j) $y = -\frac{3}{x} - 1$

3. Give the equations of the axes of symmetry for the following graphs:

a) $y = \frac{2}{x}$

b) $y = -\frac{2}{x}$

c) $y = \frac{2}{x} + 1$

d) $y = x^2$

e) $y = 3x^2$

f) $y = x^2 + 2$

g) $y = 2^x$

h) $y = \frac{3}{x}$

i) $y = -\frac{3}{x} - 1$

j) $y = \frac{3}{x} + 2$

4. Give the domain and range for the graphs in question3.

5. Give the turning point of each of the following graphs:

a) $y = x^2$

b) $y = 3x^2$

c) $y = x^2 + 2$

d) $y = 3x^2 - 1$

6. Find the equations of the following graphs:

a) A hyperbola $\left(y = \frac{k}{x} + q\right)$ that passes through the points $\left(-9;\ -\frac{1}{3}\right)$ and $(3; 1)$

b) A parabola $(y = ax^2 + q)$ that has a turning point at (0; 3) and another point at (3; 12)

c) An exponential graph $(y = a^x + q)$ that passes through the point $\left(-3;\ 1\frac{1}{8}\right)$ and the y-asymptote is y = 1.

d) A straight line that is perpendicular to $y = \frac{1}{2}x + 3$ and intersects this graph at the point (2; 4).

e) A hyperbola $\left(y = \frac{k}{x} + q\right)$ that passes through the points (-2; -4) and has an asymptote of y = -2.

f) A parabola $(y = ax^2 + q)$ that passes through the points (-2; 7) and (5; 49).

g) A hyperbola $\left(y = \frac{k}{x} + q\right)$ that passes through the point (-5; 3) and has an asymptote of y = 2.

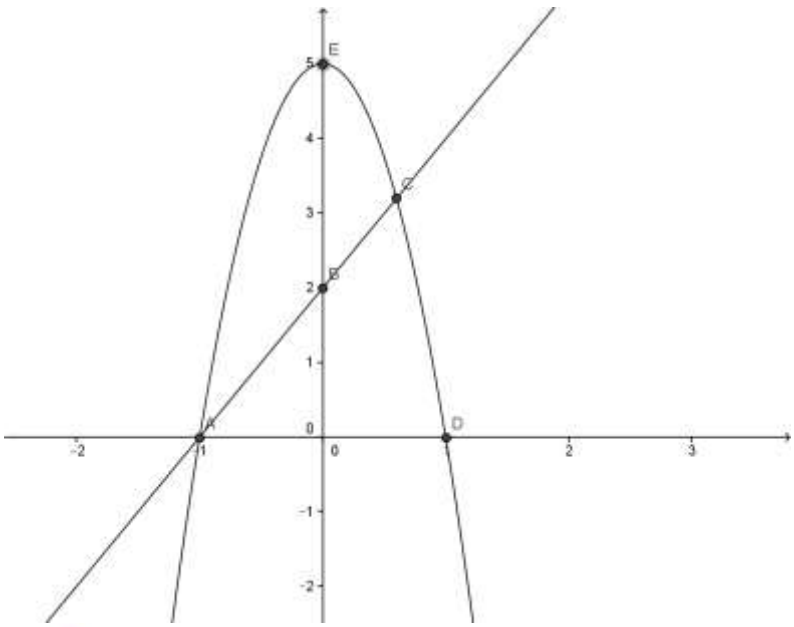
h) An exponential graph $(y = -a^x)$ that passes through the point $\left(-1;\ -\frac{1}{3}\right)$.

i) A parabola $(y = ax^2 + q)$ that passes through the point (-5; -21) and intersects the y-axis at 4.

j) A straight line with the points (-4; -17) and (1; -2).

7. Give the domain and range of each of the graphs in question 6.

8. Given the sketch of the straight line $g(x) = mx + c$ and the parabola $f(x) = ax^2 + b$, with the points A (-1; 0) and D(1; 0) as the x-intercepts of $f(x)$ and A is also the x-intercept of the straight line graph. B (0; 2) is the y-intercept of the straight-line and E (0; 5) is the y-intercept of $f(x)$. C is a point where the two graphs intersect.



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a) Determine the values of m, c, a and b.

b) Determine the coordinates of C.

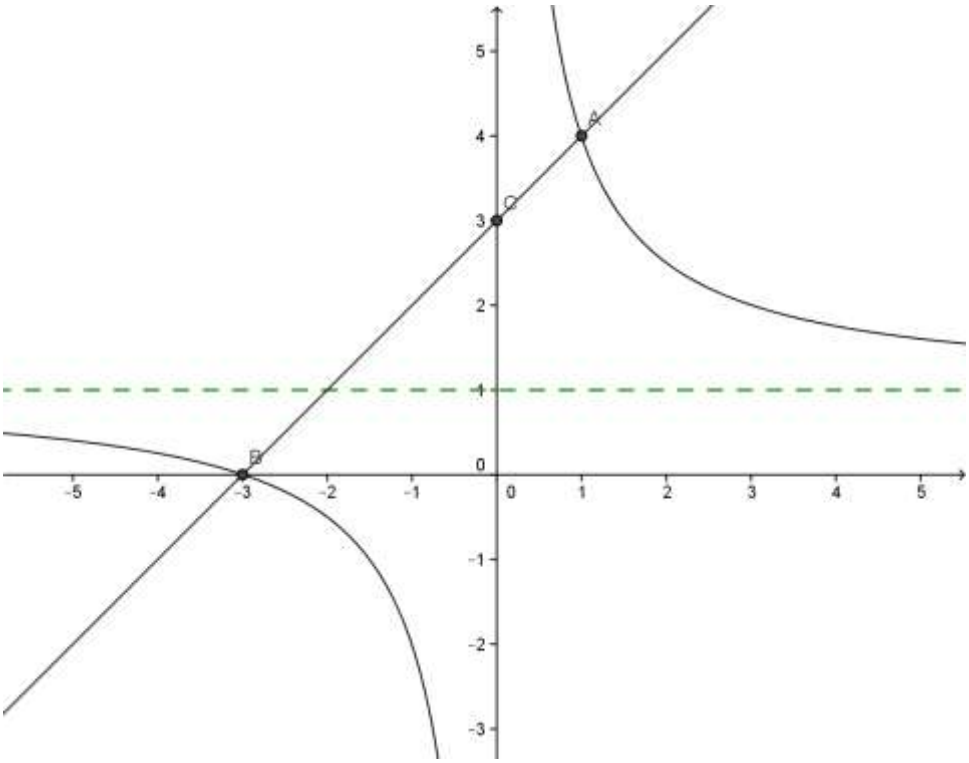
c) What is the length of EB?

d) Give the axis of symmetry for $f(x)$.

e) Determine the equation of $h(x)$ the straight line that is perpendicular to $g(x)$ and passing through the point D.

f) Determine the points where $h(x)$ intersects with $g(x)$ and $f(x)$.

9. Given the graphs of $m(x) = \frac{k}{x} + q$, the hyperbola, and $p(x) = mx + c$ the straight line with B (-3; 0) as the x-intercept of both graphs, C (0;3) the y-intercept of $p(x)$ and A the point of intersection of the two graphs. The asymptote is $y = 1$ for $m(x)$.



a) Determine the equations of $m(x)$ and $p(x)$.

b) Prove that the coordinates of A are (1; 4).

c) Give the equation for the other asymptote of $m(x)$

d) Determine the equations of the axes of symmetry for $m(x)$.

e) Determine the equation of the straight line $q(x)$ which is parallel to $p(x)$ and passes through the point (-1; 0).

f) What do you notice about the line in question e?

g) Determine the points where $q(x)$ and $m(x)$ intersect.