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Graphs & Transformations (1)

(1) Sketch the following curves showing any points where the curve crosses the coordinate axis:

(a) $y=(x+2)(x-1)(x-3)$

(b) $y=(x+3)(x+2)(2x-1)$

(c) $y=x(x+1)(x-2)$

(d) $y=-(x+3)(x+1)(x-1)$

(e) $y=(x+3)(x^2-4)$

(f) $y=x(4x^2-9)$

(g) $y=(x+3)(x+2)(1-x)$

(h) $y=(3-x)(x+2)(2-x)$

(i) $y=(x^2-2x-5)(2+x)$

(j) $y=x^3-x^2-6x$

(k) $y=-x^3-2x^2+8x$

(l) $y=-6x^3+x^2+x$

(m) $y=x^3-4x$

(2) Sketch the following curves showing the points where the curve touches or crosses the coordinate axis:

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

(b) $y=(x+1)^2(x-2)$

(c) $y=x(x-3)^2$

(d) $y=x^2(x-2)$

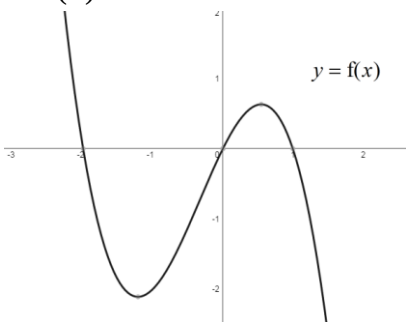
(e) $y=(1-x)x^2$

(f) $y=x^3-6x^2$

(g) $y=-x^3+2x^2$

(h) $y=-x(3-2x)^2$

(3) Part of the curve $y=\mathrm{f}(x)$ is shown below. Given $\mathrm{f}(x)$ is cubic, write down an equation for $\mathrm{f}(x)$.



(4) Sketch the following curves stating the equations of any asymptotes:

(a) $y=\frac{1}{x},\ x\neq 0$

(b) $y=\frac{3}{x},\ x<0$

(c) $y=-\frac{2}{x},\ x\neq 0$

(d) $y=-\frac{2}{3x},\ x>0$

(e) $y=\frac{1}{x^2},\ x\neq 0$

(5) (a) Sketch the graphs of $y=x^2$ and $y=2x$ on the same set of axis.
(b) State the number of solutions to the equation $x^2=2x$

(6) (a) Sketch the graphs of $y=x^3$ and $y=\frac{4}{x}$ on the same set of axis.
(b) State the number of solutions to the equation $x^3=\frac{4}{x}$

(7) (a) Sketch the graphs of $y=2x^3$ and $y=x^2$ on the same set of axis.
(b)State the number of solutions to the equation $x^2=2x^3$

(8) Explain how the graph of $y=\mathrm{f}(x)$ will be transformed when each of the following transformations are applied.

(a) $y=\mathrm{f}(x-1)$

(b) $y=\mathrm{f}(x+2)-3$

(c) $y=-\mathrm{f}(x)$

(d) $y=\mathrm{f}(-x)$

(e) $y=-\mathrm{f}(x-3)$

(f) $y=4-\mathrm{f}(x)$

(g) $y=\mathrm{f}(-x)-2$

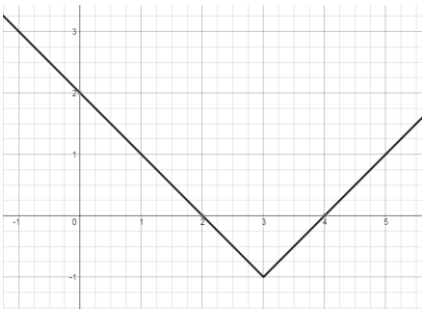
(h) $y=2\,\mathrm{f}(x)$

(i) $y=-\mathrm{f}(3x)$

(j) $y=2\,\mathrm{f}(4x)$

(k) $y=2+\mathrm{f}\left(0.5x\right)$

(9) Part of the graph $y=\mathrm{f}(x)$ is shown below.



(a) Write down the coordinates of the minimum point of $\mathrm{f}(x)$.

(b) Draw the graphs of the following stating the coordinates of the minimum point:

(i) $y=\mathrm{f}(x-1)$

(ii) $y=2\,\mathrm{f}\left(x\right)$

(iii) $y=1+\mathrm{f}\left(0.5x\right)$

(iv) $y=3\,\mathrm{f}(x+2)$

(v) $y=1-\mathrm{f}(2x)$

(10) $\mathrm{f}(x)=x(x+4)(x-2)$

(a) Draw the graph of $y=\mathrm{f}(x)$ showing any points of intersection with the coordinate axis.

(b) Sketch the curve for the following equations showing any points of intersection with the coordinate axis:

(i) $y=\mathrm{f}(x+2)$

(ii) $y=2\,\mathrm{f}(x-1)$

(iii) $y=-\mathrm{f}(-x)$

(c) $\mathrm{g}(x)=(x-3)(x+1)(x-5)$. State the single transformation that maps $y=\mathrm{f}(x)$ to $y=\mathrm{g}(x)$.

(11) $\mathrm{f}(x)=-x^2-4x+14$

(a) Express in the form $\mathrm{f}(x)$ in the form $a(x+b)^2+c$.

(b) Sketch the graph of $y=\mathrm{f}(x)$ stating the coordinates of the maximum point.

(c) Sketch the graphs of the following equations stating the coordinates of the maximum point:

(a) $y=2\,\mathrm{f}(x-1)$

(b) $y=\mathrm{f}(-x)+1$

(c) $y=2+\mathrm{f}(0.25x)$

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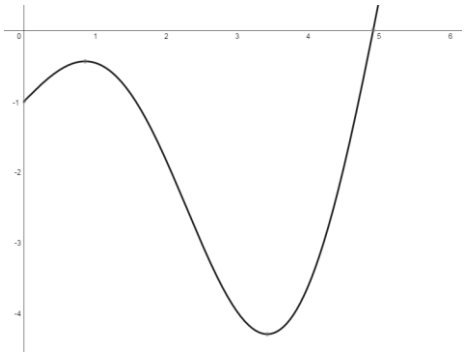
Graphs & Transformations (2)

(1) The graph of $y = \mathrm{f}(x)$, $0 \le x \le 6$ is shown below. The graph touches the y axis at the point $(0, -1)$ and crosses the x axis at the point $(5, 0)$.



(a) State the coordinates of the point where the curve $y = -5\,\mathrm{f}(x)$ touches the y axis.

(b)The curve $y = \mathrm{f}(ax)$ crosses the x axis at the point $(12.5, 0)$. Find the value of a

(c) Write down the number of solutions to the equation $\mathrm{f}(x) + 3 = 0$.

(d) Write down the number of solutions to the equation $2\,\mathrm{f}(x) = -6$.

(2) $\mathrm{f}(x) = (2x-1)^2 - 4$.
(a) Sketch the graph of $y = \mathrm{f}(x)$ stating the coordinates of the points where the curve crosses the coordinate axis and the coordinates of the minimum point.

(b) Sketch the graphs of the following curves stating the coordinates of the maximum or minimum point:
(i) $y = 1 - \mathrm{f}(x)$
(ii) $y = \mathrm{f}(x-2) + 1$
(iii) $y = 3\,\mathrm{f}(-x)$

(c) The equation $\mathrm{f}(x) + k = 0$ has equal roots. State the value of k.

(3) Sketch the graph of $y = (2px-1)(2-x)(x+3)$ given $1 < p < 2$. Label clearly any points of intersection with the coordinate axis.

(4) (a) Sketch the graph of $y = \dfrac{2}{x} - 1,\ x \neq 0$ showing any points of intersection with the coordinate axis and stating the equations of any asymptotes.

(b) The curve $y = \dfrac{2}{x} - 1$ meets the straight line $y = x$ at the points A and B. Find the coordinate of A and B.

(c) State the single transformation that maps the graph of $y = \dfrac{2}{x} - 1$ onto the graph of $y = \dfrac{2}{x+3} - 1$.

(d) Write down the coordinates of the point where the graph of $y = \dfrac{2}{x+3} - 1$ crosses the y axis.

(5) (a) Sketch the graphs of $y = x\left(x^2 - 1\right)$ and $y = \dfrac{2}{x},\ x \neq 0$ on the same set of axis.

(b) State the number of solutions to the equation $x\left(x^2 - 1\right) = \dfrac{2}{x}$

(c) Show the equation $x\left(x^2 - 1\right) = \dfrac{2}{x}$ can be written as $x^4 - x^2 - 2 = 0$.

(d) Using the substitution $p = x^2$, or otherwise, solve the equation $x^4 - x^2 - 2 = 0$ giving your answers in exact form.