

A student is collecting data on traffic arriving at a motorway service station during weekday lunchtimes. The random variable X denotes the number of cars arriving in a randomly chosen period of ten seconds.

The student counts the number of arrivals, X , in each of 100 ten-second periods. The data are shown in the table below.

| | | | | | | | |
|----------------|----|----|----|----|---|---|------|
| x | 0 | 1 | 2 | 3 | 4 | 5 | >5 |
| Frequency, f | 18 | 39 | 20 | 12 | 8 | 3 | 0 |

From MEI S2 June 2005

Here are some statements about the situation above. Do you think they are true?

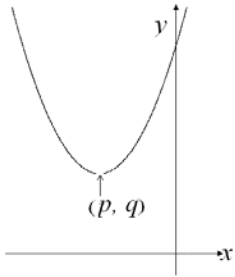
1. Weekends have been excluded because the pattern of traffic might be different to weekdays.
2. The mean is 2.5.
3. If the final frequency had not been zero, it would not be possible to calculate the mean.
4. If the final frequency had not been zero, the mean would be higher.
5. The mean and variance are different so these data cannot be from a Poisson distribution.
6. For a Poisson distribution to be a suitable model, cars must arrive independently. This is likely to be true as each driver decides whether or not to stop independently of other drivers.
7. For a Poisson distribution to be a suitable model, the mean number of cars arriving in 10 seconds has to be large.
8. The distribution is positively skewed.

Can you find the errors on this page?

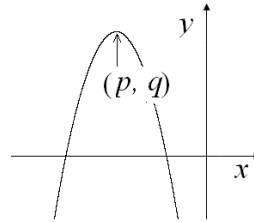
FUNCTIONS

Quadratic graphs

$y = a(x + p)^2 + q$ for $a > 0$
 $x = p$ is a line of symmetry

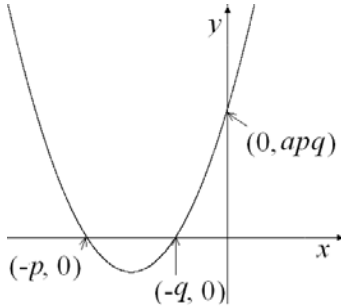


$y = a(x + p)^2 + q$ for $a < 0$;
 $x = p$ is a line of symmetry

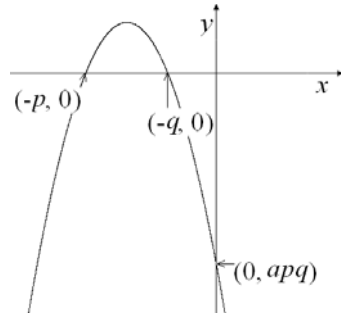


In these diagrams, $p > 0$ and $q > 0$

$y = a(x + p)(x + q)$ for $a > 0$



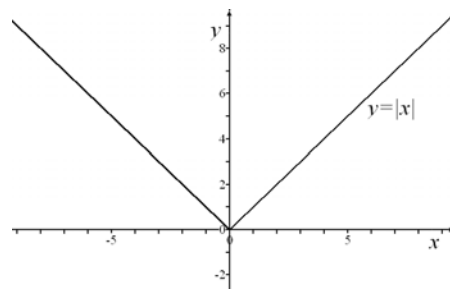
$y = a(x + p)(x + q)$ for $a < 0$



Modulus function

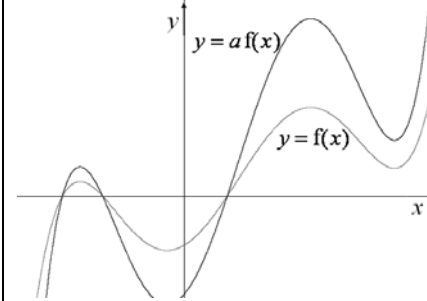
The modulus of the real number x , denoted $|x|$, is defined as follows:

For $x > 0$, $|x| = x$
 For $x < 0$, $|x| =$

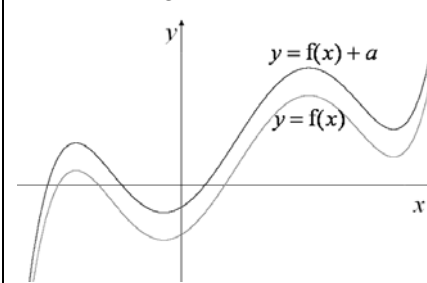


Transforming graphs

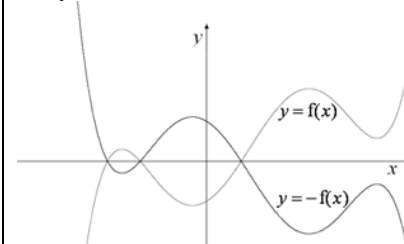
$y = af(x)$ is a stretch of $y = f(x)$, scale factor a parallel to the y -axis ($a > 1$ in diagram)



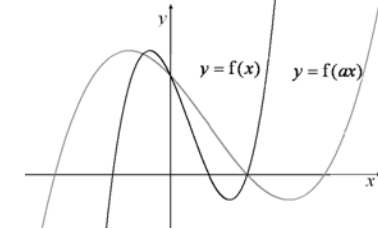
$y = f(x) + a$ is a translation of $y = f(x)$, a units up ($a > 0$ in diagram)



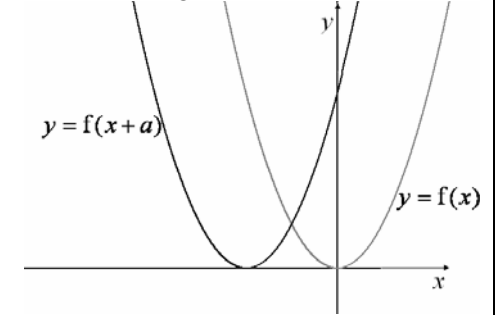
$y = f(-x)$ is a reflection of $y = f(x)$ in the y -axis



$y = f(ax)$ is a stretch of $y = f(x)$, scale factor a parallel to the x -axis ($a > 1$ in diagram)



$y = f(x + a)$ is a translation of $y = f(x)$, a units to the right ($a > 0$ in diagram)



$y = -f(x)$ is a reflection of $y = f(x)$ in the x -axis

