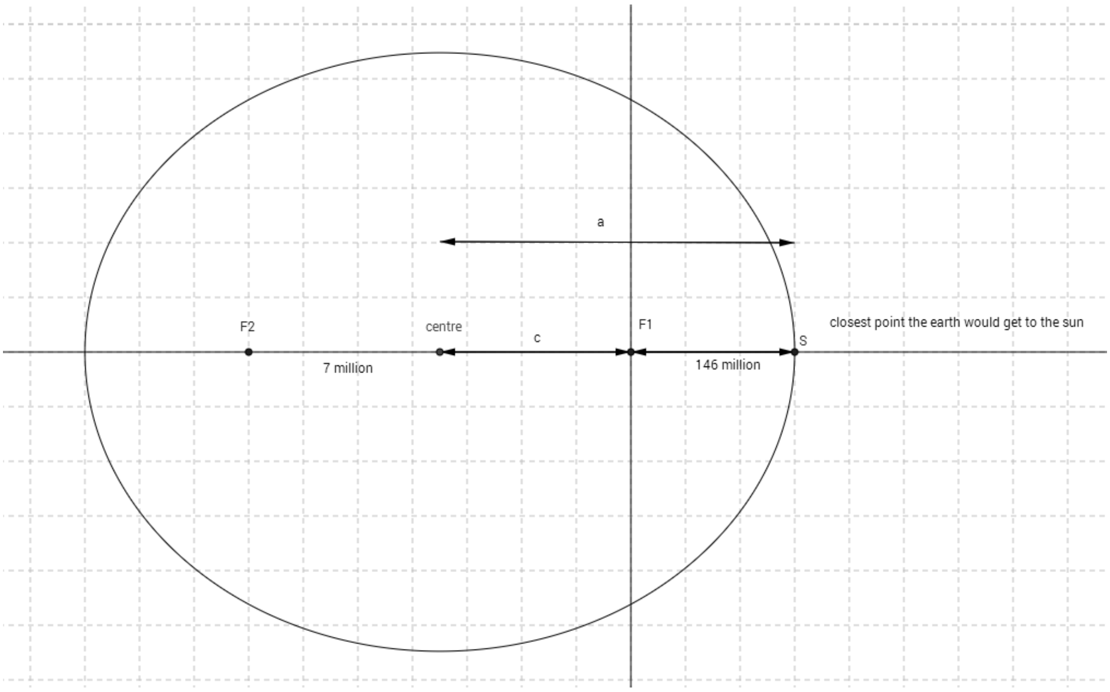
## Earth




$F_1 = (0,0)$ $F_2 = (-7\times10^6,0)$ The foci are at (c,0) and (-c,0)

$2c = 7\times10^6$ $c = 3.5\times10^6\,km$

*c* = distance from centre to focus, *a* = distance from centre to vertex/x-intercept

$c + 146\times10^6 = a = 3.5\times10^6 + 146\times10^6 = 149.5\times10^6\,km(3sf)$

$b^2 = a^2 - c^2$

$b = \sqrt{(a^2 - c^2)} = \sqrt{[(149.5\times10^6)^2 - (3.5\times10^6)^2]} = 149\times10^6\,km(3sf)$

The centre is $3.5\times10^6\,km$ from $F_1$ so the centre is at $(-3.5\times10^6,0)$

$$\frac{(x+3.5\times10^6)^2}{(149.5\times10^6)^2} + \frac{y^2}{(149\times10^6)^2} = 1$$

Intercept = (0,*y*) so y intercept is when *x* = 0 y = 149.5 x $10^6$km

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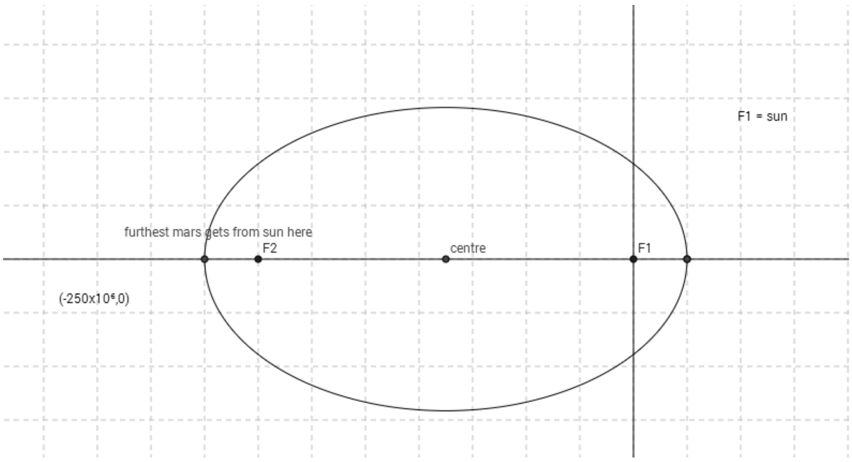
## Mars



2$a$ is total horizontal distance, $a$ is distance from centre to vertex/x intercept
$c$ is distance from centre to focus

$2a = 460\times10^6 \qquad a = 230\times10^6$

$250\times10^6 = a + c \qquad c = 250\times10^6 - 230\times10^6 = 20\times10^6$

$b = \sqrt{(a^2 - c^2)} = 229\times10^6\,km(3sf)$

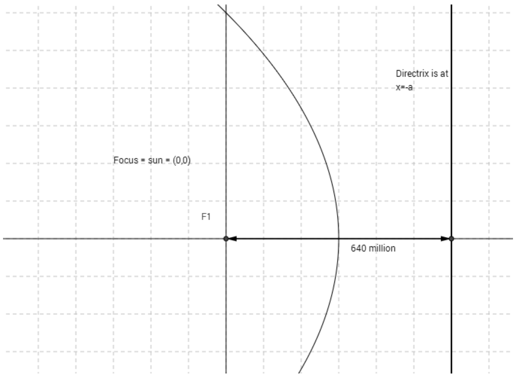
Centre must be $20\times10^6$ km from $F_1$ which means centre is at (-$20\times10^6$,0)

Equation: $\dfrac{(x+20\times10^6)^2}{(230\times10^6)^2} + \dfrac{y^2}{(229\times10^6)^2} = 1$

Asteroid crosses path of Mars at point (0,$y$) ie when $x$ = 0 and $y$ = ?

When x = 0 y = $228\times10^6\,km(3sf)$ 2

Comet




$2a = 640\times10^6 \qquad a = 320\times10^6$

Shift may be $320\times10^6$ to the right? In which case

$y^2 = -1280\times10^6(x - 320\times10^6)$

$y^2 = -1280\times10^6(0 - 320\times10^6)$

$y = \sqrt{4.096\times10^{17}} = 640000000km$ 3