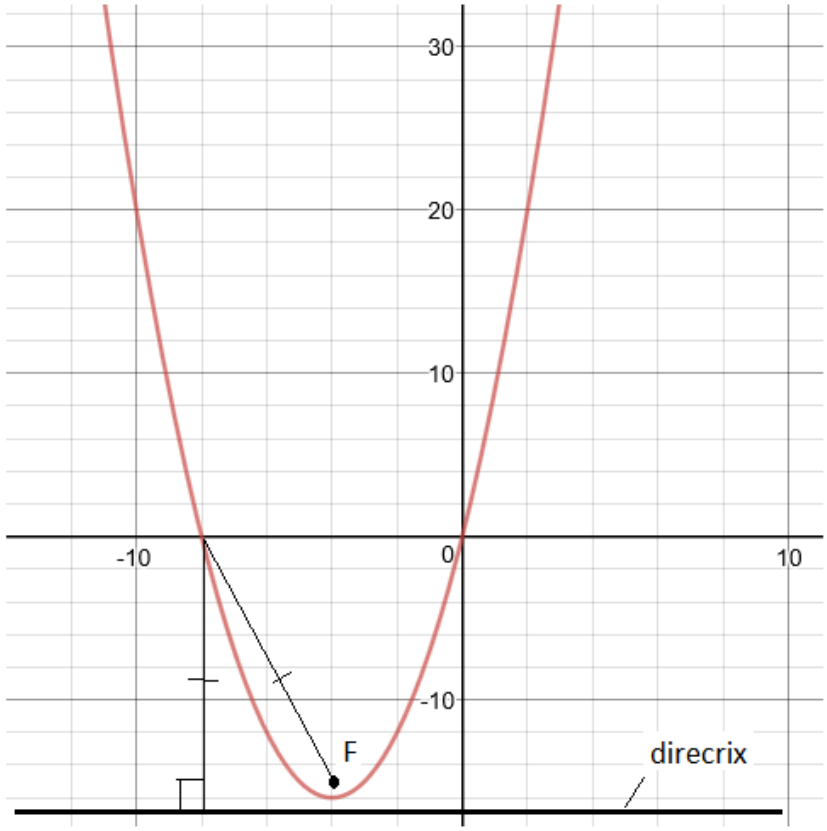
## Answer on Question #66192 – Math – Calculus

### Question

Sketch the graph of the function $f$ defined by $f(x) = x^2 + 8x$, clearly giving all the properties used in it.

### Solution




$$x^2 + 8x = (x^2 + 8x + 16) - 16 = (x + 4)^2 - 16$$

$$f(x) = (x + 4)^2 - 16$$

This is a vertical parabola, opens up, because the coefficient $a = 1$ near $x^2$ is positive.

The properties are as follows:

$$\text{vertex is } (-4, -16);$$
$$\text{minimum value is } f(-4) = -16;$$

$$f(x) \text{ is decreasing on } (-\infty, -4); f(x) \text{ is incresing on } (-4, \infty);$$

symmetry: line $x = -4$;

$$x^2 + 8x = 0,$$
$$x(x + 8) = 0,$$
$$x = 0 \text{ or } x = -8;$$
$$\text{x} - \text{intercepts are } (0,0), (-8,0);$$
$$f(0) = 0^2 + 8 \cdot 0 = 0;$$
$$\text{y} - \text{intercept is } (0,0);$$

the focus is $F = \left(-4, -\frac{63}{4}\right)$;

the directrix is $y = -\frac{65}{4}$.