

## 5.2. Power Functions and Polynomial Functions.

$$f(x) = mx + b$$

$$f(x) = ax^2 + bx + c \quad \text{Vertex } (h, k)$$

$$h = -\frac{b}{2a}; k = f\left(-\frac{b}{2a}\right)$$

$a > 0$    $a < 0$  

## Power functions

Definition of a power function • A power function is a function of the form  $f(x) = k \cdot x^p$ ;  $k, p$ : constants.  $k, p$  are real numbers.

$$f(x) = x^2; k=1, p=2$$

$$f(x) = -3x^5; k=-3, p=5$$

$$f(x) = \frac{1}{x^2} = x^{-2}; k=1, p=-2$$

$$f(x) = \frac{10}{x^{17}} = 10x^{-17}; k=10, p=-17$$

$$\frac{1}{x^{17}} = x^{-17}; k=1, p=-17$$

$$f(x) = \frac{k}{x^p} = k \cdot x^{-p}$$

$$\sqrt[n]{x^m} = x^{\frac{m}{n}}$$

$$f(x) = \sqrt[3]{x^5} = x^{\frac{5}{3}}; k=1, p=\frac{5}{3}$$

$$f(x) = -3\sqrt{x} = -3x^{\frac{1}{2}}; k=-3, p=\frac{1}{2}$$

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## Non-examples

$$f(x) = 2x^3 + 5x + 6$$

$$f(x) = 2^x$$

## End behaviors of power functions

$$f(x) = x^2$$

$x$  moves to right on  $x$ -axis; the graph rise from left to right

Read as  $x$  approaches  $\infty$

$$x \rightarrow \infty, f(x) \rightarrow \infty$$

$$x \rightarrow -\infty, f(x) \rightarrow \infty$$

$x$  moves to the left on the  $x$ -axis,  $f(x)$  will rise from right to left

$x \rightarrow -\infty, f(x) \rightarrow \infty$   
Read as  $x$  approaches negative infinity,  $f(x)$  approaches infinity.

End behavior of  $f(x) = x^2$

$$\text{As } x \rightarrow \infty, f(x) \rightarrow \infty$$

$$\text{As } x \rightarrow -\infty, f(x) \rightarrow \infty$$

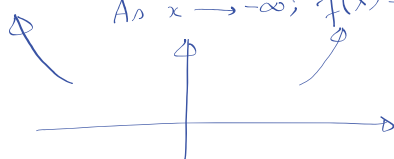
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$$f(x) = x^{2016}$$

$$\text{As } x \rightarrow \infty, f(x) \rightarrow ? \infty$$

$$\text{As } x \rightarrow -\infty, f(x) \rightarrow ? \infty$$



$$f(x) = -5x^{2016}$$

$$\text{As } x \rightarrow \infty, f(x) \rightarrow -\infty$$

$$\text{As } x \rightarrow -\infty, f(x) \rightarrow -\infty$$

$$f(x) = 10x^3$$

$$\text{As } x \rightarrow \infty, f(x) \rightarrow \infty$$

$$\text{As } x \rightarrow -\infty, f(x) \rightarrow -\infty$$

$$f(x) = -3x^{2017}$$

$$\text{As } x \rightarrow \infty, f(x) \rightarrow -\infty$$

$$\text{As } x \rightarrow -\infty, f(x) \rightarrow \infty$$



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