

Graph the function and identify intervals on which the function is increasing, decreasing or constant.

30)  $f(x) = |x+1| + |x-1| - 3$

33)  $g(x) = 3 - (x - 1)^2$

Use your calculator to find all local maxima and minima and the values of x where they occur.

43.  $h(x) = -x^3 + 2x - 3$

45)  $f(x) = x^2 \sqrt{x+4}$

State whether the function is odd, even, or neither. Support graphically and confirm algebraically.

Even

- Find  $f(1)$
- Find  $f(-1)$
- If  $f(1) = f(-1)$   
then even
- If  $f(1)$  and  $f(-1)$   
are same number  
with opposite signs  
then odd

A)  $f(x) = 4x^2$

$$\left. \begin{aligned} f(1) &= 4(1)^2 = 4 \\ f(-1) &= 4(-1)^2 = 4 \end{aligned} \right\} \text{even}$$

B)  $f(x) = 3x^3 \rightarrow \text{odd}$

$$\begin{aligned} f(1) &= 3(1)^3 = 3 \\ f(-1) &= 3(-1)^3 = -3 \end{aligned}$$

C)  $f(x) = \sqrt{x^4 + 1} \rightarrow \text{even}$

$$f(1) = \sqrt{(1)^4 + 1} = \sqrt{2}$$

$$f(-1) = \sqrt{(-1)^4 + 1} = \sqrt{2}$$

D)  $f(x) = 4x + x^3$

$$f(1) = 4(1) + (1)^3 = 5$$

$$f(-1) = 4(-1) + (-1)^3 = -5$$

odd

E)  $f(x) = 4x + x^2$

$$f(1) = 4(1) + (1)^2 = 5$$

$$f(-1) = 4(-1) + (-1)^2 = -3$$

Neither

Reminder:

Sometimes a value of  $x$  that seems to be a vertical asymptote is actually a hole

V.A.  $x$ -value that make bottom zero without making top zero.

Horizontal Asymptote

• If degree on bottom is greater than degree on top H.A.  $y=0$

• If degree on top is greater than degree on bottom NO H.A.

• If degrees are equal then  $y = \frac{LC}{LC}$

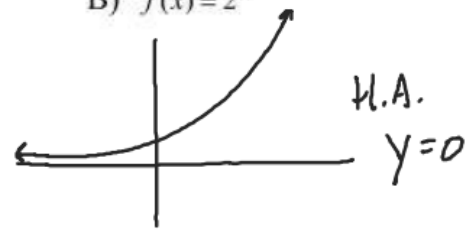
Find all horizontal and vertical asymptotes

A)  $f(x) = \frac{x+1}{x}$

V.A.  $x=0$

H.A.  $y = \frac{1}{1} = 1$

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



C)  $f(x) = \frac{-3x^2+1}{x^2-1}$

$$x^2 - 1 = 0$$

$$(x+1)(x-1) = 0$$

$$x = -1 \quad x = 1$$

V.A.  $x = -1, x = 1$

H.A.  $y = \frac{-3}{1} = -3$

E)  $f(x) = \frac{3x^3+3}{x^2+1}$

V.A. — None

H.A. — None

D)  $f(x) = \frac{3x-9}{x^2-9}$

$$x^2 - 9 = 0$$

$$(x-3)(x+3) = 0$$

~~$x = -3$~~

V.A.  $x = -3$

H.A.  $y = 0$

F)  $f(x) = \frac{x+5}{x^3-27}$

V.A.  $x = 3$

H.A.  $y = 0$

Determine if each function is continuous. If the function is not continuous, find the x-axis location of each discontinuity and classify each discontinuity as infinite or removable. Also find any horizontal asymptotes.

A)  $f(x) = \frac{3x^2 + 15x}{x+5}$   $\frac{3x(x+5)}{x+5}$

Discontinuous @  $x = -5$

Hole @  $x = -5$

Removable

V.A. None

H.A. None

B)  $f(x) = \frac{x^2 + 3x}{x+2}$   $\frac{x(x+3)}{x+2}$

Discontinuous @  $x = -2$

V.A.  $x = -2$

H.A. None

C)  $f(x) = \frac{9x+6}{x^2-4}$

Discontinuous @  $x = -2, 2$

V.A.  $x = -2, 2$

H.A.  $y = 0$

D)  $f(x) = \frac{9x+18}{x^2-4}$

Discontinuous @  $x = -2, 2$

V.A.  $x = 2$

Hole  $x = -2$

H.A.  $y = 0$

E)  $f(x) = \frac{x-5}{x^2-4x-5}$

Discontinuous @  $x = -1, 5$

V.A.  $x = -1$

Hole  $x = 5$

H.A.  $y = 0$

$$x^2 - 4 = 0$$

$$(x+2)(x-2) = 0$$

$$x = -2, 2$$

$$x^2 - 4x - 5 = 0$$

$$(x-5)(x+1) = 0$$

$$x = 5 \quad x = -1$$