??
ϵ
$\lim_{x \to c} f(x) =$
L
$f(x) =$
$1/x^2$
??
x
$f(x)$

$$\lim_{x \to \infty} \frac{1}{x^2} = 0.$$

$f(x) =$
$1/x^2$ $_a t_i n f i n i t y_o n e o v e r x s q u a r e d f i g u r e s / f i g o n e o v e r x s q u a r e d$
$_a t_i n f i n i t y L i m i t s a t I n f i n i t y a n d H o r i z o n t a l A s y m p t o t e$
$\lim_{x \to \infty} f(x) =$
L
$\epsilon >$
0
$M >$
0
$x >$
M
$|f(x) -$
$L| <$
ϵ
$\lim_{x \to -\infty} f(x) =$
L
$\epsilon >$
0
$M <$
0
$x <$
M
$|f(x) -$
$L| <$
ϵ
$\lim_{x \to \infty} f(x) =$
L
$\lim_{x \to -\infty} f(x) =$
L
$y =$
L
hori-
zon-
tal
asymp-
tote
f
$\lim_{x \to \infty} f(x) =$
∞
??

$_h zasy 1 Approximating horizontal asymptotes Approximate the horizontal asymptote(s) of f^2 \frac{}{x^2+4}$

$\lim_{x\to-\infty} \frac{x^2}{x^2+4} and \lim_{x\to\infty} \frac{x^2}{x^2+4}.$

??
f
f(x)
x
f
y =
1

x f(x)
??
−10
−100
−10000
??
f(x) =
x/(x^2+
1)
y =
0
??
f(x) =
x/\sqrt{x^2+1}
y =
1
y =
−1
??
f(x) =
(\sin x)/x
x =
0
x
±∞
f(x)

$\lim_{x\to\infty} 1/x$
x
1/x
1/x
x
ϵ
1/x <
ϵ
x >
1/ϵ
$\lim_{x\to\infty} 1/x =$
0
$\lim_{x\to\infty} \frac{1}{x^n} = 0 and \lim_{x\to-\infty} \frac{1}{x^n} = 0$

$\lim_{x\to\infty} \frac{x^3+2x+1}{4x^3-2x^2+9}.$

x^3
x
$\lim_{x\to\infty} \frac{x^3+2x+1}{4x^3-2x^2+9} =$
$\lim_{x\to\infty} \frac{1/x^3}{1/x^3}.$
$\frac{x^3+2x+1}{4x^3-2x^2+9}$
=
$\lim_{x\to\infty} \frac{x^3/x^3+2x/x^3+1/x^3}{4x^3/x^3-2x^2/x^3+9/x^3}$
=
$\lim_{x\to\infty} \frac{1+2/x^2+1/x^3}{4-2/x+9/x^3}.$
1/x^n
$\frac{1+0+0}{4-0+0} = \frac{1}{4}.$

$_r ational_f n_a t_i nfty Limits of Rational Functions at Infinity Let be a rational function of the following form : f(x) = \frac{a_n x^n + a_{n-1} x^{n-1} + ... + a_1 x + a_0}{b_m x^m + b_{m-1} x^{m-1} + ... + b_1 x + b_0}, where any of the coefficients may be 0 except for _n$

b_m
n
=
m
$\lim_{x\to\infty} f(x) =$
$\lim_{x\to-\infty} f(x) =$
$\frac{a_n}{b_m}$
n
<
m
$\lim_{x\to\infty} f(x) =$
$\lim_{x\to-\infty} f(x) =$
0
n
>
m
$\lim_{x\to\infty} f(x)$
$\lim_{x\to-\infty} f(x)$
x
n
=
m