October 7, 2010

Note Title 10/7/2010

§4.2 #60

$$f(x) = x^3 - 6x^2 + 9x$$

a) $f(x) = x(x^2 - 6x + 9)$

$= x(x-3)^2$

zeros:	$x = 0$	$x = 3$
multiplicity	1	2

b) at $x = 0$ graph crosses

at $x = 3$ graph touches

c) y- intercept : $x = 0$

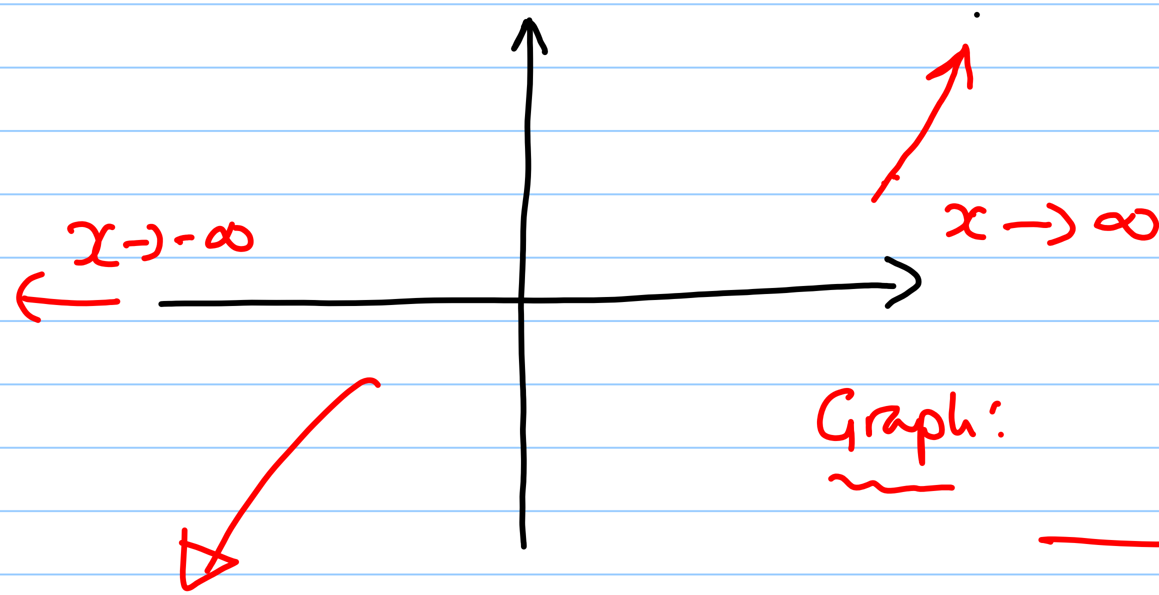
$f(0) = 0$ $(0,0)$

additional points

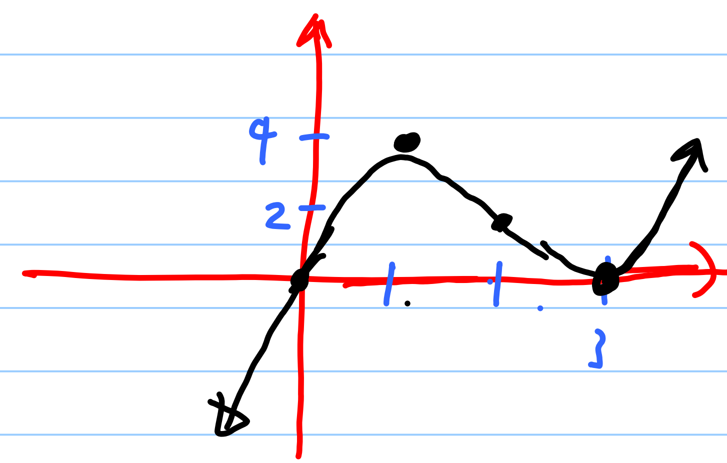
x	$f(x)$
-1	-16
1	4
2	2
4	4

d) End behavior:

$$f(x) = \boxed{x^3} - 6x^2 + 9$$



Graph:



#14

$$f(x) = -2x^3 + 4x^2 - 6x$$

$$= -2x(x^2 - 2x + 3)$$

Zero: $\boxed{x = 0}$

$$x^2 - 2x + 3 = 0$$

$$x = \frac{+2 \pm \sqrt{(-2)^2 - 4(1)(3)}}{2(1)}$$

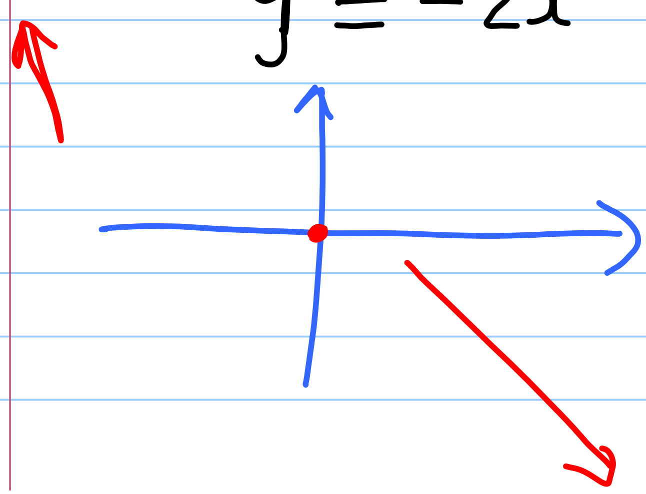
$$= \frac{2 \pm \sqrt{4 - 12}}{2}$$

$$= \frac{2 \pm \sqrt{-8}}{2}$$

No real

End behavior

$$y = -2x^3$$



Observation

$f(x) = 1/x - 1$ $\qquad$ $f(x) = \dfrac{1}{x-1}$

$f(2) = 1/2 - 1$ $\qquad$ $f(2) = \dfrac{1}{2-1} = \dfrac{1}{1} = 1$

$\frac{1}{2} - 1$ X

$f(x) = 1/(x-1)$

Rational Functions

$$f(x) = \frac{x+1}{x^2-x-6}$$

Domain $\{x \mid x^2 - x - 6 \neq 0\}$

$$x^2 - x - 6 = 0$$
$$(x-3)(x+2) = 0$$
$$x = 3, x = -2$$

Domain

$$(-\infty, -2) \cup (-2, 3) \cup (3, \infty)$$

b) $g(x) = \dfrac{3x}{x^2+9}$

Domain: x such that $x^2+9 \neq 0$.

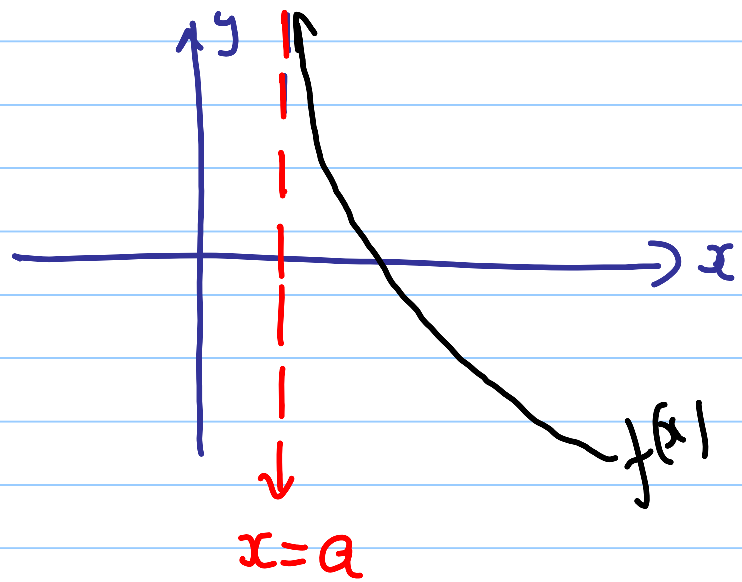
$x^2+9 = 0$

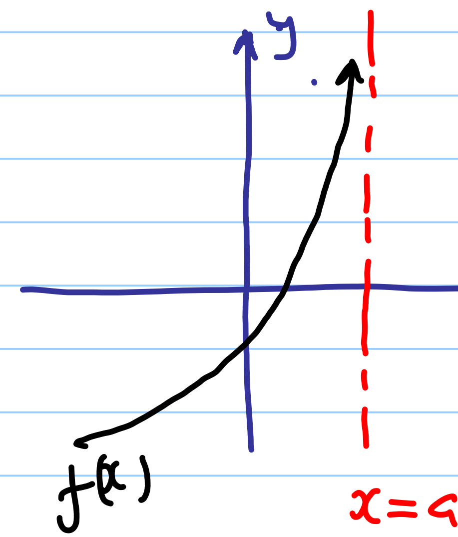
$x^2 = -9$ No real solutions.

Hence

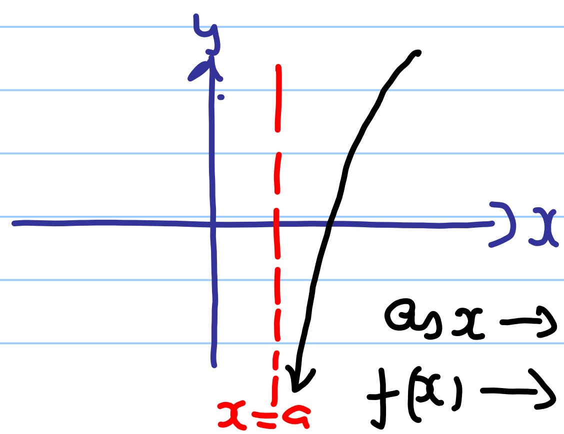
Domain: $(-\infty, \infty)$.

Vertical asymptotes

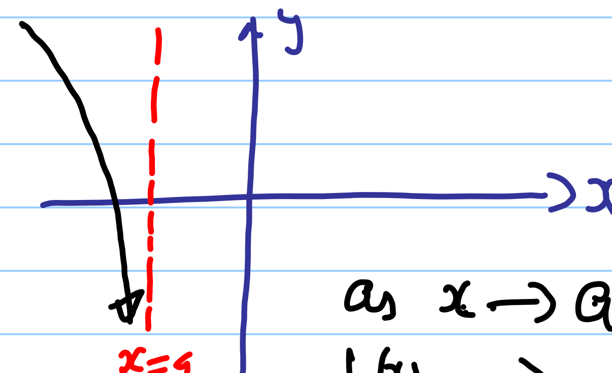




as $x \to a^-$.
$f(x) \to \infty$



as $x \to a^+$
$f(x) \to -\infty$



as $x \to a^-$.
$f(x) \to -\infty$

$$f(x) = \frac{5x+2}{6x^2 - x - 2}$$

vertical asymptotes:

$$6x^2 - x - 2 = 0$$

$$x = \frac{-(-1) \pm \sqrt{1 - 4(6)(-2)}}{2(6)}$$

$$= \frac{1 \pm \sqrt{1+48}}{12}$$

$$= \frac{1 \pm 7}{12}$$

$$x = \frac{1+7}{12} \quad \text{or} \quad x = \frac{1-7}{12}$$

$$= \frac{8}{12} \qquad\qquad = -\frac{6}{12} = -\tfrac{1}{2}$$

$$= \frac{2}{3}$$

VA: the lines $x = 2/3$ and $x = -1/2$

Example

$$f(x) = \frac{x+2}{x^3 - 3x^2 - 10x}$$

$$= \frac{x+2}{x(x^2 - 3x - 10)}$$

$$= \frac{\cancel{x+2}}{x\,\cancel{(x+2)}(x-5)}$$

VA: $x = 0$

$x = 5$