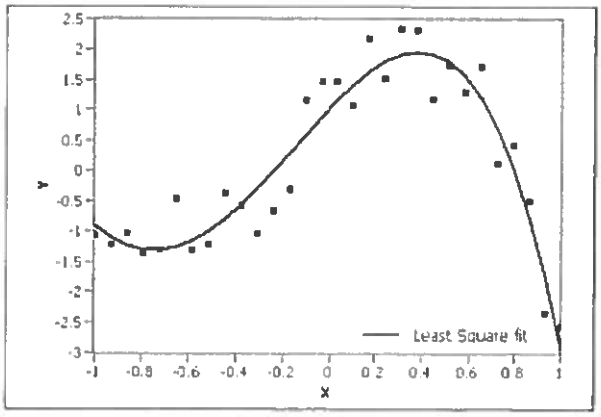
IB Math Studies / Algebra 2

4.5 Polynomial Functions

Linear Model	Quadratic Model	Exponential Model

Polynomial models are functions whose largest exponent ("degree") is 3 or more.



Coordinates of local maximum:

Coordinates of local minimum:

Interval(s) where $f(x)$ is increasing:

Interval(s) where f(x) is decreasing:

y-intercept: x-intercept:

IB Math Studies
Mr. Steponic
4.5 Polynomial Functions

1. Consider the function $f(x) = -\frac{1}{3}x^3 + \frac{5}{3}x^2 - x - 3$.

a) Sketch the graph of $y = f(x)$ for $-3 \leq x \leq 6$ and $-10 \leq y \leq 10$ showing clearly the axes intercepts and local maximum and minimum points. Use a scale of 2 cm to represent 1 unit on the x-axis and a scale of 1 cm to represent 1 unit on the y-axis.

b) Find the value of $f(-1)$. $= 0$

(trace, $X = -1$, enter)

c) Write down the coordinates of:

i) the y-intercept. $(0, -3)$

$X = 0$

ii) the local maximum. $(3, 0)$

iii) the local minimum. $(0.33, -3.16)$

iv) the point where $f(x) = 7$. $(-1.88, 7)$

d) Write down the interval(s) where

X

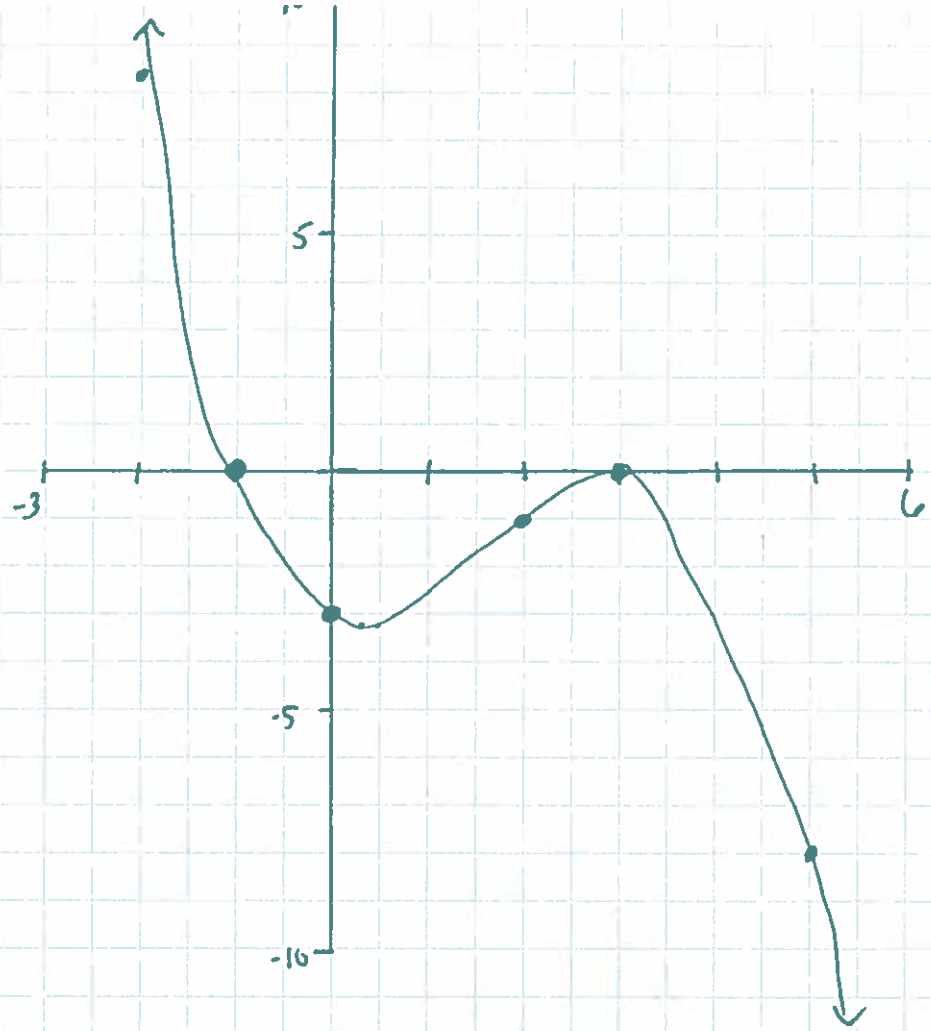
i) $f(x)$ is increasing.

$0.33 < X < 3$

ii) $f(x)$ is decreasing.

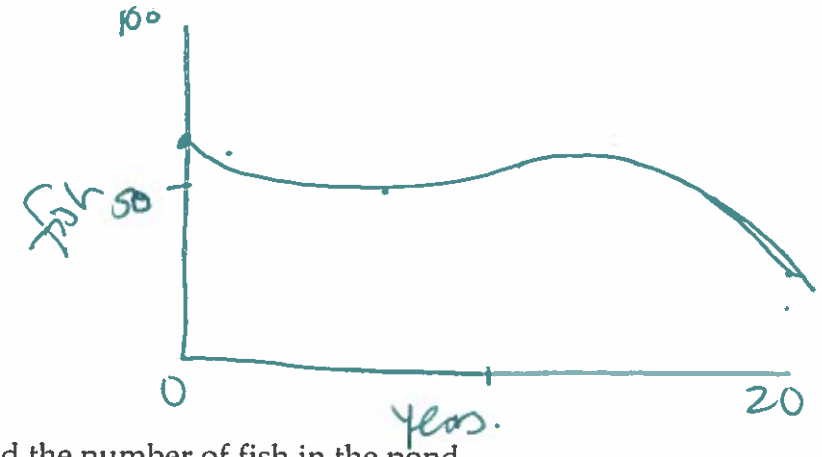
$-\infty < X < 0.33$

$3 < X < \infty$


5
-3
6
-5
-10

2. The number of fish, F, in a pond from the period 1995 to 2015 is modeled using the formula $F(x) = -0.030x^3 + 0.86x^2 - 6.9x + 67$ where x is the number of years after 1995.

a) Sketch a fully-labeled graph of the function for $0 \leq x \leq 20$.



b) Find the number of fish in the pond

i) in 1995 $x=0$

67 fish

ii) in 2003 $x=8$

51.48 fish.

c) Use your graph to find the following features of the function:

i) The year after 2005 that saw the most fish in the pond.

max: (13.4, 56.8)

1995 + 13 = 2008

ii) The minimum number of fish in the pond before 2005.

min: (5.73, 50.1) → About 50 fish in 1995 + 5 = 2000

iii) The years during which the fish population was increasing.

(min to max)

between 2000 – 2008

iv) The year when the fish population last reached 50.

$50 = -0.03x^3 + .86x^2 - 6.9x + 67$

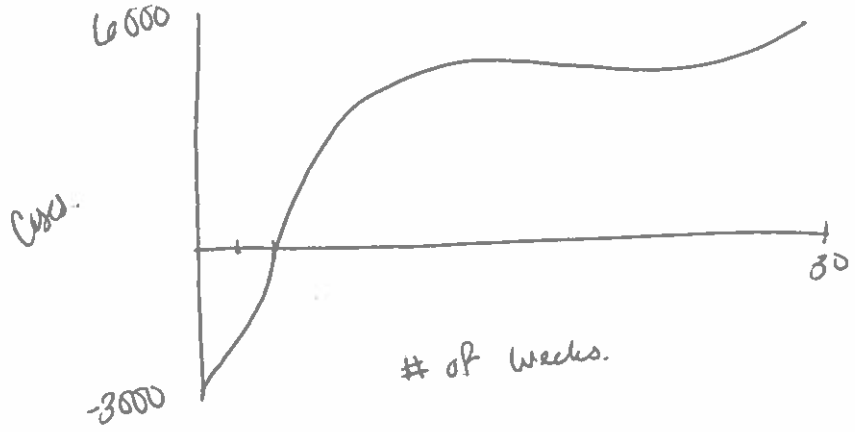
$x = 17.2$

$+1995$

2012

3. A pandemic is modeled using the equation $y = (x - 20)^3 + 5000$ where x is the number of weeks after the outbreak started and y is the total number of cases reported.

a) Sketch a fully-labeled graph of the function for $0 \leq x \leq 30$.



b) Find the number of cases reported

i) after 5 weeks $x=$ 1625 cases

ii) after 20 weeks $x=$ 5000 cases.

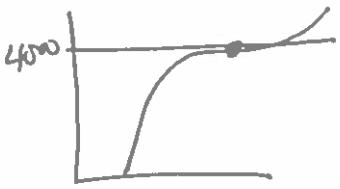
c) Use your graph to find the following features of the function:

i) The week the outbreak was first discovered.

$x=2.9$ $y=0$

End of 2nd week.

ii) The week in which 4000 cases were reported.



$x=10$ weeks.

iii) The weeks during which the reported cases were decreasing.

Never.