Calculus and Probability
Assignment 1

x
x
Group 6

September 1, 2018

Exercise 6

a)

$$0 = x - x^3$$
$$x = x^3$$
$$x \in \{-1, 0, 1\}$$

$x \in \{-1, 0, 1\}$

b)

$$0 < x - x^3$$
$$x < x^3$$
$$0 < x < 1 \text{ and } x < -1$$

$0 < x < 1$ and $x < -1$

Exercise 7

$$y = a + (b - a)x$$
$$y = a + xb - xa$$

When choosing $a = b$, we can run over all values thus y has no restrictions.
$y \in \mathbb{R}$

Exercise 8

a) This function is odd because for all x and $y = -x$, $3x - x^3 = -(3x - x^3)$. The function is odd.

b) This function is even because for all x and $y = -x$, $f(x) = f(y)$. The function is even.

Exercise 9

a) Domain:

$$\begin{aligned} 7 - x^2 &>= 0 \\ 7 &>= x^2 \\ |\sqrt{7}| &>= x \\ x &<= |\sqrt{7}| \end{aligned}$$

Range:
The maximum of the function is at $x = 0$, thus $1 + \sqrt{7}$. The minimum of the function is at $sqrt7 - x^2 = 0$ and thus $f(x) = 1$. Domain: $D(f) = -\sqrt{7} <= x <= \sqrt{7}$, Range: $R(f) = 1 <= y <= 1 + \sqrt{7}$

b) Domain:
The only restriction for x is $x \neq 0$.
Range:
$f(x)$ will never equal 0 or anything lower than 0. This means $f(x) > 0$. Domain: $D(f) = x \neq 0$, Range: $R(f) = y > 0$

Exercise 10

a)

$$\begin{aligned} y &= \frac{ax + b}{cx + d} \\ y * (cx + d) &= ax + b \\ ycx + yd &= ax + b \\ ycx - ax &= b - yd \\ x * (yc - a) &= b - yd \\ x &= \frac{b - yd}{yc - a} \end{aligned}$$

$x = \frac{b-yd}{yc-a}$

b) Always. Always.

Exercise 11

a)

$$\begin{aligned} \lim_{x \to 2} \frac{x - 2}{x^2 + x - 6} &= \lim_{x \to 2} \frac{x - 2}{(x - 2)(x + 3)} \\ &= \lim_{x \to 2} \frac{1}{(x + 3)} \\ &= \frac{1}{2 + 3} \\ &= \frac{1}{5} \end{aligned}$$

$\frac{1}{5}$

b)

$$\begin{aligned}\lim_{x\to 1}\frac{x^2-4x+3}{x^2+x-2} &= \lim_{x\to 2}\frac{(x-3)(x-1)}{(x-1)(x-2)}\\ &= \lim_{x\to 2}\frac{(x-3)}{(x-2)}\\ &= \frac{(1-3)}{(1-2)}\\ &= \frac{-2}{-1}\\ &= 2\end{aligned}$$

2

Answer Form Assignment 1

Name	x
Student Number	x

Question	**Answer**
6a (1pt)	$x \in \{-1, 0, 1\}$
6b (1pt)	$0 < x < 1$ and $x < -1$
7 (1pt)	$y \in \mathbb{R}$
8a (0.5pt)	The function is odd.
8b (0.5pt)	The function is even.
9a (1pt)	Domain: $D(f) = -\sqrt{7} <= x <= \sqrt{7}$, Range: $R(f) = 1 <= y <= 1+\sqrt{7}$
9b (1pt)	Domain: $D(f) = x \neq 0$, Range: $R(f) = y > 0$
10a (1pt)	$x = \frac{b-yd}{yc-a}$
10b (1pt)	Always.
11a (1pt)	$\frac{1}{5}$
11b (1pt)	2