MAT 282 Lab 0 - Introduction

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The purpose of this lab is to learn different commands in maple that will assist us to complete mathematics. For example, we use the commands such as adding, subtracting, factoring, and expanding. In maple, you can also graph different functions and take detrivatives. Along with detrivatives you can take antidetrivatives and graph those as well. Overall, this lab with give an brief overview of how to use maple and its common commands.

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> restart;
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Use the Maple calculator to compute a) 1+7, b) 8/12 (as a reduced fraction), and c) 12/7 (with 7 decimal places)

> $1+7;$

$$8 \quad (1)$$

> $\frac{8}{12};$

$$\frac{2}{3} \quad (2)$$

> $\mathbf{\frac{12}{7};}$

$$\frac{12}{7} \quad (3)$$

```
> evalf(%);
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$$1.7142857 \quad (4)$$

>

In this section, store $7-\frac{29}{6}$ to a variable, using 4 decimal places and suppressing the result. Then display the result

> $z := 7 - \frac{29}{6}$

$$z := \frac{13}{6} \quad (5)$$

> $z;$

$$\frac{13}{6} \quad (6)$$

>

> $evalf(\%);$

$$2.1667 \quad (7)$$

Expand the expression $(x-y)^5$.

> $expand((x-y)^5);$

$$x^5 - 5x^4y + 10x^3y^2 - 10x^2y^3 + 5xy^4 - y^5 \quad \mathbf{(8)}$$

Store the polynomial $x^3 + x^2 - 2$ **to a function called f1(x)**

> $f1(x) := x^3 + x^2 - 2;$

$$f1 := x \rightarrow x^3 + x^2 - 2 \quad \mathbf{(9)}$$

Find f1(-2).

Factor f1(x).

>

Use the Maple solve command to find the roots of f1(x).

>

> $evalf(f1(-2));$

$$-6. \quad \mathbf{(10)}$$

> $factor(f1(x));$

$$(x-1)(x^2 + 2x + 2) \quad \mathbf{(11)}$$

> $solve(f1(x) = 0);$

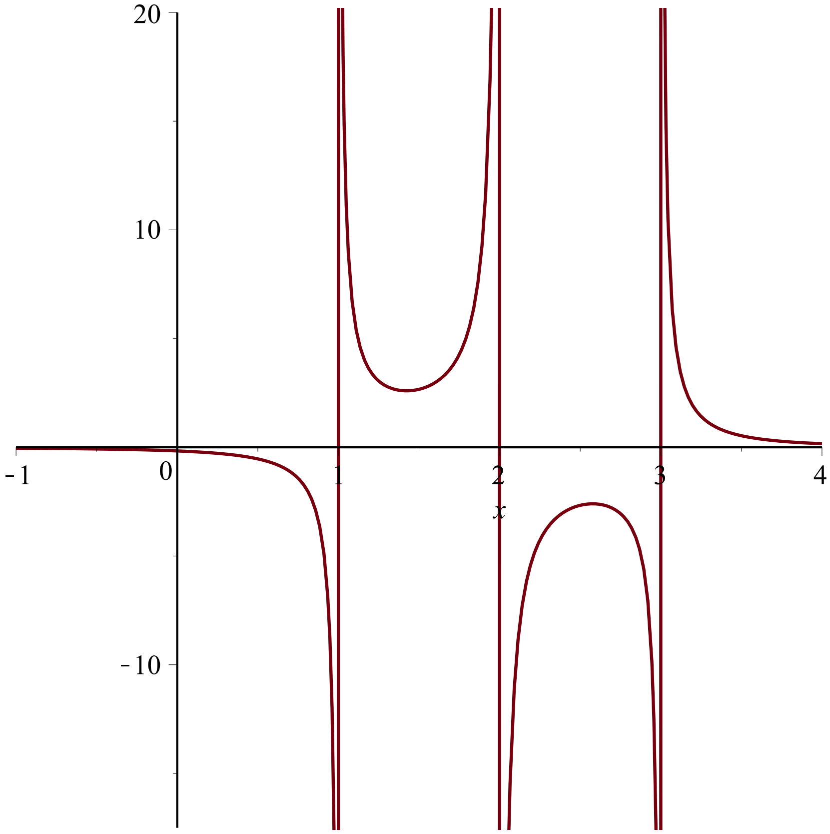
$$1, -1 - I, -1 + I \quad \mathbf{(12)}$$

Graphing

4) Graph y=1/(x^3-6 x^2 + 11 x -6) on the interval [-1,4]

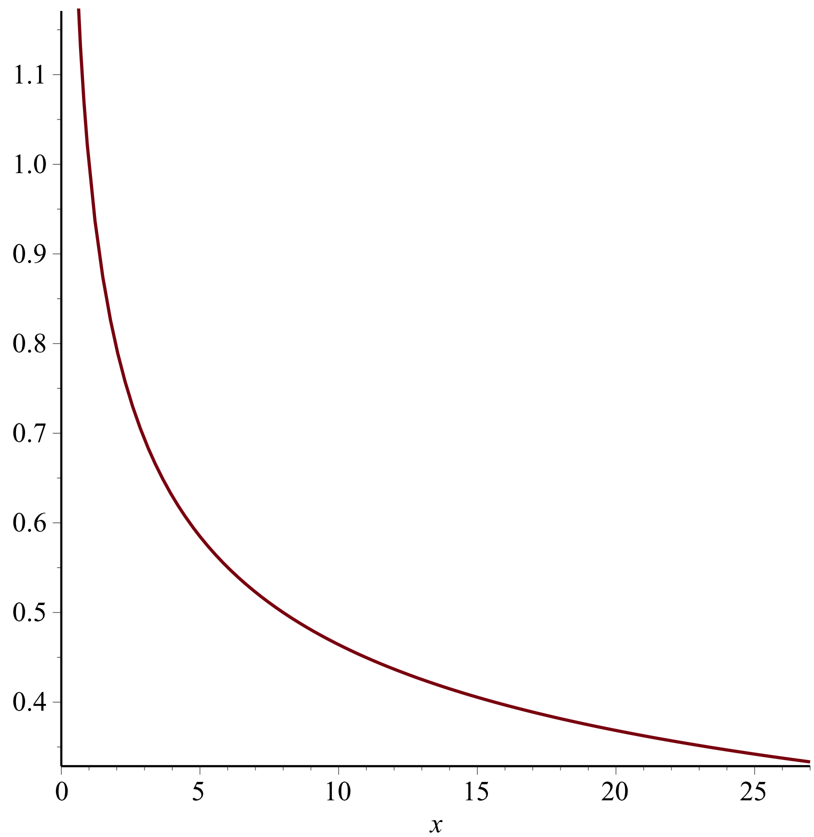
>

> $plot\left(\left[\frac{1}{x^3 - 6x^2 + 11x - 6}\right], x = -1..4\right);$



5) Graph y=1/x^(1/3) on [-27, 27]. Do your results make sense?

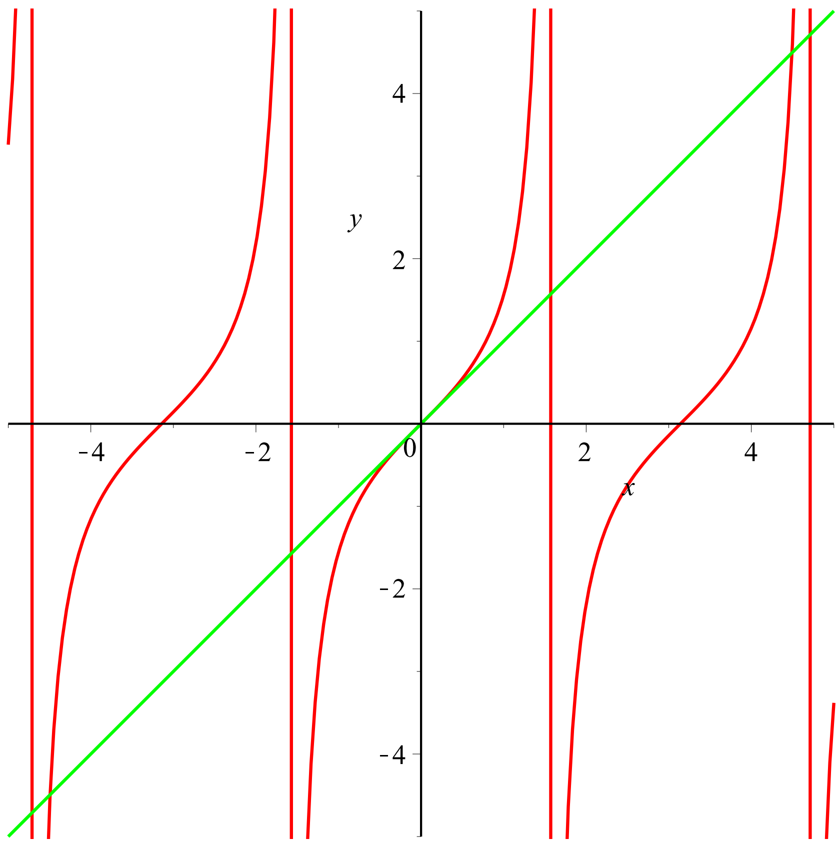
> $plot\left(\left[\frac{1}{x^{\frac{1}{3}}}\right], x=-27..27\right);$



6) Graph y=tan(x) and y= x together on [-5,5]. Use the mouse to find approximate solutions to tan(x) = x. (What is this type of equation called?)

>

> $plot([\tan(x), x], x=-5..5, y=-5..5, color=[red, green]);$



linear equation for y=x

Derivatives

**Compute the first, second, and third derivatives of f1(x) above. Store the first derivative into f1p (x),
the second into f1pp(x), and the third into f1ppp(x)**

>

>

> $f1p(x) := diff(f1(x), x);$

$$f1p := x \rightarrow \frac{d}{dx} f1(x) \quad \textbf{(13)}$$

> $f1p(x);$

$$3x^2 + 2x \quad \textbf{(14)}$$

> $f1pp(x) := diff(f1(x), x, x);$

(15)

$$f1pp := x \to \frac{d^2}{dx^2} f1(x) \qquad (15)$$

> $f1pp(x);$

$$6\,x + 2 \qquad (16)$$

> $f1ppp(x) := diff(f1(x), x, x, x);$

$$f1ppp := x \to \frac{d^3}{dx^3} f1(x) \qquad (17)$$

> $f1ppp(x)$

$$6 \qquad (18)$$

Type in the command you would use to compute the nth derivative in this notation.

> $diff(f1p(x), x\$n);$

$$3 \text{ pochhammer}(3 - n, n)\, x^{2-n} + 2 \text{ pochhammer}(2 - n, n)\, x^{1-n} \qquad (19)$$

> $f2(x) := e^{3 \cdot x};$

$$f2 := x \to e^{3x} \qquad (20)$$

> $diff(f2(x), x\$5);$

$$243\, e^{3x} \ln(e)^5 \qquad (21)$$

> $f3(x, y) := x^2 - 3 \cdot x \cdot y + y^3;$

$$f3 := (x, y) \to x^2 - 3\,x\,y + y^3 \qquad (22)$$

> $f3(1, -1);$

$$3 \qquad (23)$$

> $diff(f3(x, y), x);$

$$2\,x - 3\,y \qquad (24)$$

Integrals

Here are some more exercises:

8) Use the int command to find the antiderivative of f(x) = x^5 + 7 x^2 + x + 1.

> $int(x^5 + 7\,x^2 + x + 1, x);$

$$\frac{1}{6}\,x^6 + \frac{7}{3}\,x^3 + \frac{1}{2}\,x^2 + x \qquad (25)$$

>

9) Use the pallette integral to find the area under the graph of f1(x) between x = -2 and x = 3.

> $\int_{-2}^{3} f1(x)\, dx$

$$\frac{215}{12} \qquad (26)$$