Math 2250
Maple Project 1 Part A
Solutions

\[ \text{> restart:} \]
1.1 Solving quadratic equations.

By hand: either try factoring, or if that doesn’t work use the quadratic equation, that the roots of

\[ a x^2 + b x + c = 0 \]

are given by

\[
x = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \\
x = \frac{-b - \sqrt{b^2 - 4ac}}{2a}
\]

1.1A

\[ x^2 + 4x + 4 = (x + 2)^2 \]

so the solution to

\[ x^2 + 4x + 4 = 0 \]

is \( x = -2 \). Maple can do this by

\[ \text{> eqtn:=x^2+4*x+4:} \]
\[ \text{ans:=solve(eqtn=0,x):} \]
\[ \text{eqtn1:=(x-ans[1])*(x-ans[2]):} \]
\[ \text{expand(eqtn1);} \]

\[
\text{ans := -2, -2} \\
\text{eqtn1 := (x+2)^2} \\
x^2 + 4x + 4
\]

1.1B The roots of

\[ x^2 + 2x + 3 = 0 \]

are, (using the quadratic formula)

\[
x = -1 + \sqrt{2} I \\
x = -1 - \sqrt{2} I
\]

so the equation factors into

\[
(x + 1 - \sqrt{2} I) (x + 1 + \sqrt{2} I) = 0
\]
Maple check:

```maple
> eqtn:=x^2+2*x+3:
  ans:=solve(eqtn=0,x):
  eqtn1:=(x-ans[1])*(x-ans[2]);
  expand(eqtn1);
```

```
ans := -1 + I, -1 - I

eqtn1 := (x + 1 - I)(x + 1 + I)

x^2 + 2 x + 3
```

1.1C

\[ x^2 - 4 x + 3 = (x - 3)(x - 1) \]

so the roots of eqtn=0 are

\[ x = 3 \]
\[ x = 1 \]

Maple:

```maple
> eqtn:=x^2-4*x+3:
  ans:=solve(eqtn=0,x):
  eqtn1:=(x-ans[1])*(x-ans[2]);
  expand(eqtn1);
```

```
ans := 3, 1

eqtn1 := (x - 3)(x - 1)

x^2 - 4 x + 3
```
Problem 2:

> with(plots):

Warning, the name changecoords has been redefined

1.2.A

> f := x -> sin(2*x);
plot(f(x), x=0..4*Pi, color=black);

\[ f := x \rightarrow \sin(2x) \]

1.2.B

> g := x -> abs(3*x+2);
plot(g(x), x=-4..1, color=black);

\[ g := x \rightarrow |3x+2| \]

1.2.C

> h := x -> 10+1.5*sin(Pi/12*(t-12));
plot(h(t), t=0..24, color=black);

\[ h := x \rightarrow 10 + 1.5 \sin \left(\frac{\pi(t-12)}{12}\right) \]