

1. Use Maple's **solve** and **fsolve** commands to find the solutions of the following quadratic equations:

$$x^2 + 3x - 7 = 0 \quad \text{and} \quad x^3 - 8x^2 + 24x - 24 = 0.$$

2. Consider the functions:

$$f(x) = 4 - x \quad \text{and} \quad g(x) = \frac{2x}{6 - x - x^2}.$$

Use Maple to plot these functions, then find the points of intersection. To plot multiple functions and ones that are discontinuous along with restricting the range, you use the following Maple command:

```
> plot({f(x),g(x)},x=-10..10,y=-10..10,discont=true,color=blue);
```

The **fsolve** command can be used to find a particular point of intersection by restricting the range of the search.

```
> xs := fsolve(f(x)=g(x),x=2..10); f(xs);
```

3. Use Maple's **diff** and **int** commands to differentiate and integrate the following functions:

$$f(x) = e^{-x} \cos(3x) \quad \text{and} \quad g(x) = e^{-x^2}.$$

Along with the indefinite integral, integrate both functions from 0 to  $\infty$ . The definite integral from 0 to  $\infty$  in Maple is done with the command

```
> int(f(x),x=0..infinity);
```

4. Consider the function

$$f(x) = (9 - x^2) e^{-x^2}.$$

Graph this function on the interval  $x \in [-5, 5]$  and  $x \in [2.9, 4]$ . Is this an even, odd, or neither function? Find all intercepts ( $x$  and  $y$ ). Find all extrema and points of inflection (both  $x$  and  $y$  values).

5. Use Maple's **DEplot** to create a vector flow field for the logistic growth model

$$\frac{dP}{dt} = 0.1P \left( 1 - \frac{P}{100} \right).$$

Use the initial conditions  $P(0) = -1$ ,  $P(0) = 1$ ,  $P(0) = 50$ , and  $P(0) = 150$ . The Maple commands for a vector field are

```
> with(DEtools);
> DEplot(diff(y(t),t)=-0.2*y(t),y(t),t=0..10,[[y(0)=20],[y(0)=10]],y=0..150,
  stepsize=.05);
```

Describe the behavior of the logistic equation that you observe from this vector field plot.