A1Q4

Shown in the plot below is a plot of $f := x^5 - 4x^4 + 4x - 4$ on the domain -1 < x < 4.5. Shown also is the line tangent to $f(x)$ at $x = 3$.

Use Maple to reproduce the plot. Do this by using the diff and eval commands to compute the slope of $f(x)$ at $x = 3$ so you can determine the equation for the tangent line.

```
> restart:
> f := x^5 - 4*x^4 + 4*x -4;
```

$$f := x^5 - 4x^4 + 4x - 4 \quad (1)$$

```
> g := diff(f,x);
```

$$g := 5x^4 - 16x^3 + 4 \quad (2)$$

```
> m := eval(g,x=3);
```

$$m := -23 \quad (3)$$

```
> n := eval(f,x=3);
```

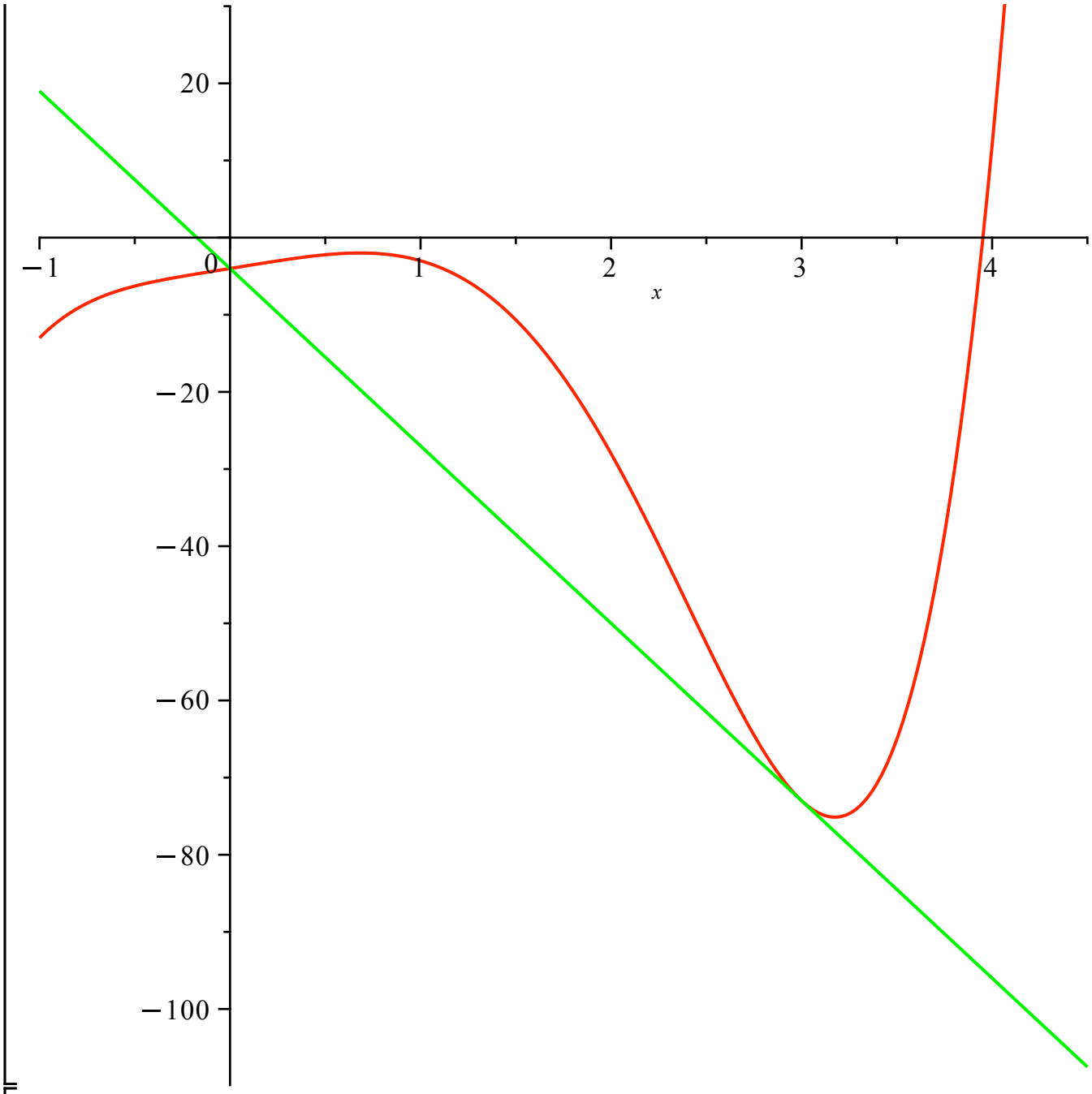
$$n := -73 \quad (4)$$

Equation of a line is: (y-y0) = m(x-x0) -> (y-(-73)) = -23(x-3) -> (y+73) = -23x + 69 -> y = -23x -4.

```
> h := m*x -4;
```

$$h := -23x - 4 \quad (5)$$

```
> plot([f,h],x=-1..4.5, color = [red,green]);
```



Express the area enclosed by the tangent line and f(x) as a definite integral. Evaluate the definite integral.

```
> solve(f-h=0,x);
```

$$0,\ -1-I\sqrt{2},\ -1+I\sqrt{2},\ 3,\ 3 \qquad \textbf{(6)}$$

```
> int(f-h,x=0..3);
```

$$\frac{243}{5} \qquad \textbf{(7)}$$