

*restart;*

### ▼ Aufgabe 1: Integration

$$\int \tan(x) \cdot \sin(x) \, dx;$$

$$-\sin(x) + \ln(\sec(x) + \tan(x)) \quad (1.1)$$

### ▼ Aufgabe 2: Numerisches Lösen von Gleichungen

$$fsolve\left(x^2 = \sin(x), x = \frac{1}{2} \dots 1\right);$$

$$0.8767262154 \quad (2.1)$$

### ▼ Aufgabe 3: Prozeduren: Quersumme

```
quersumme := proc(n :: nonnegint)
```

```
  local z, q :
```

```
  z := n :
```

```
  q := 0 :
```

```
  while z ≠ 0 do
```

```
    q := q + irem(z, 10, 'z') :
```

```
  end do:
```

```
  return q :
```

```
end proc:
```

```
quersumme(12345);
```

$$15 \quad (3.1)$$

```
quersumme(0);
```

$$0 \quad (3.2)$$

```
quersumme(17);
```

$$8 \quad (3.3)$$

```
quersumme(100);
```

$$1 \quad (3.4)$$

```
quersumme(987654321);
```

$$45 \quad (3.5)$$

### ▼ Aufgabe 4: Prozeduren: Vollkommene Zahlen

```
with(numtheory) :
```

```
f := proc(n)
```

```
  local L, i, M:
```

```
  L := NULL :
```

```

for  $i$  while  $nops([L]) < n$  do
   $M := divisors(i) \setminus \{i\}$  :
  if  $add(m, m=M) = i$  then  $L := L, i$  : end if:
end do:
return  $[L]$  :
end proc:

```

$f(1)$ ; [6] (4.1)

$f(2)$ ; [6, 28] (4.2)

$f(3)$ ; [6, 28, 496] (4.3)

$f(4)$ ; [6, 28, 496, 8128] (4.4)

## ▼ Aufgabe 5: Die Mandelbrot-Menge

*with(ImageTools) :*

▼ a)

$img := Create(201, 301, background = white);$

$\left[ \begin{array}{l} 1..201 \times 1..301 \text{ Array} \\ \text{Data Type: float}_8 \\ \text{Storage: rectangular} \\ \text{Order: C\_order} \end{array} \right]$

(5.1.1)

▼ b)

$t := (x, y) \rightarrow \left( \frac{1}{100} \cdot x - \frac{201}{100} \right) + \left( \frac{-1}{100} \cdot y + \frac{101}{100} \right) \cdot I;$   
 $(x, y) \rightarrow \frac{1}{100} x - \frac{201}{100} + I \left( -\frac{1}{100} y + \frac{101}{100} \right)$

(5.2.1)

$t(1, 1)$ ; -2 + I (5.2.2)

$t(301, 201)$ ; 1 - I (5.2.3)

$t(201, 101)$ ; 0 (5.2.4)

**c)**

```
m := proc(c)
  local z, i :
  z := 0.0;
  for i to 50 do
    z := z2 + c :
    if |z| > 50 then
      return 1 :
    end if:
  end do:
  return 0 :
end proc:
```

**d)**

```
for y to 201 do
  for x to 301 do
    img[y, x] := m(t(x, y)) :
  end do:
end do:
```

**e)**

```
View(img); # Öffnet neues Fenster, daher:
Preview(img);
```

