Aufgabe 1

```
Integrate[x * Sin[x], x]
```

$$-x\ \text{Cos}[x] + \text{Sin}[x]$$

```
Integrate[x * Sin[x ^ 2], x]
```

$$-\frac{1}{2}\ \text{Cos}\left[x^2\right]$$

```
Integrate[x / (1 + x ^ 2), x]
```

$$\frac{1}{2}\ \text{Log}\left[1 + x^2\right]$$

```
Integrate[(1 + x) / (1 - x), x]
```

$$-x - 2\ \text{Log}[1 - x]$$

```
Integrate[s * E ^ s ^ 2, s]
```

$$\frac{e^{s^2}}{2}$$

```
Integrate[t ^ 2 * E ^ t, t]
```

$$e^t\ \left(2 - 2\ t + t^2\right)$$

Aufgabe 3

```
f[x_] := x ^ 3 + x ^ 2 - 2 x
```

- **Ableitungen**

```
f'[x]
f''[x]
f'''[x]
f''''[x]
```

$$-2 + 2\ x + 3\ x^2$$

$$2 + 6\ x$$

$$6$$

$$0$$

- **Nullstellen**

```
Solve[f[x] == 0, x]
```

$$\{\{x \to -2\}, \{x \to 0\}, \{x \to 1\}\}$$

Nullstellen bei x1=-2, x2 = 0, x3=1

Extremwerte

```
Solve[f'[x] == 0, x]
```

$$\left\{\left\{x \to \frac{1}{3}\left(-1-\sqrt{7}\right)\right\}, \left\{x \to \frac{1}{3}\left(-1+\sqrt{7}\right)\right\}\right\}$$

```
N[%]
```

```
{{x → -1.21525}, {x → 0.548584}}
```

```
f''[1/3 (-1 - Sqrt[7])]
```

$$2+2\left(-1-\sqrt{7}\right)$$

```
% < 0
```

```
True
```

```
FullSimplify[f[1/3 (-1 - Sqrt[7])]]
```

$$\frac{2}{27}\left(10+7\sqrt{7}\right)$$

```
N[%]
```

```
2.11261
```

Maximum bei $\left(\frac{1}{3}\left(-1-\sqrt{7}\right), \frac{2}{27}\left(10+7\sqrt{7}\right)\right)$

```
f''[1/3 (-1 + Sqrt[7])]
```

$$2+2\left(-1+\sqrt{7}\right)$$

```
% > 0
```

```
True
```

```
FullSimplify[f[1/3 (-1 + Sqrt[7])]]
```

$$-\frac{2}{27}\left(-10+7\sqrt{7}\right)$$

```
N[%]
```

```
-0.63113
```

Minimum bei $\left(\frac{1}{3}\left(-1-\sqrt{7}\right), \frac{2}{27}\left(10+7\sqrt{7}\right)\right)$

Wendepunkte

```
Solve[f''[x] == 0, x]
```

$$\left\{\left\{x \to -\frac{1}{3}\right\}\right\}$$

```
f'''[-1/3]
```

```
6
```

```
f[-1 / 3]
```

$$\frac{20}{27}$$

Wendepunkt bei (-1/ 3, 20/ 27)

```
f'[-1 / 3]
```

$$-\frac{7}{3}$$

```
FullSimplify[Solve[-7 / 3 * (-1 / 3) + d == 20 / 27, d]]
```

$$\left\{\left\{d \to -\frac{1}{27}\right\}\right\}$$

Wendetangente y = -7/ 3 x -1/ 27

Graph

```
Plot[{f[x], -7 / 3 x - 1 / 27}, {x, -3, 3}]
```