

Blatt 9

Aufgabe 34

```
> restart:
> f := (5*x^3 - 3*x - 2)/((2 + x)*(3-x));
(a)
> T := seq(convert(taylor(f, x = 0, k), polynom), k = 1..15):
> plot([ f, seq(T[j], j = 6..11) ], x = -2..3, y = -3..12, color
= [ red, yellow, green, black, brown, magenta, blue ],
numpoints = 2000, legend = [ 'f', 'T6', 'T7', 'T8', 'T9',
'T10', 'T11' ]);
> plot([ f, seq(T[j], j = 6..11) ], x = -1..3/2, y = -1..2, color
= [ red, yellow, green, black, brown, magenta, blue ],
numpoints = 2000, legend = [ 'f', 'T6', 'T7', 'T8', 'T9',
'T10', 'T11' ]);
(c)
> seq(abs(evalf(subs(x = -1/2, f) - subs(x = -1/2, T[j])))), j =
1..15);
> seq(abs(evalf(subs(x = 1, f) - subs(x = 1, T[j])))), j = 1..15);
```

Aufgabe 35

```
> restart:
(a)
> P := 2, 3, 4, 5;
> seq(print(Sum((n^p)/(p^n), n = 1..infinity) = sum((n^p)/(p^n),
n = 1..infinity)), p in P);
(b)
> An := (2*n + 1)^2 / ((2*n + 1)^2 + 1),
(-1)^n * (1 - 1/n),
(-1)^n * (1 - n/(n-1));
> seq(print(Product(an, n = 2..infinity) = evalc(product(an, n =
2..infinity))), an in An);
> #Product((2*n + 1)^2 / ((2*n + 1)^2 + 1), n = 2..infinity) =
product((2*n + 1)^2 / ((2*n + 1)^2 + 1), n = 2..infinity);
> #evalc(%);
> #Product((-1)^n * (1 - 1/n), n = 2..infinity) = product((-1)^n
* (1 - 1/n), n = 2..infinity);
> #Product((-1)^n * (1 - n/(n - 1)), n = 2..infinity) = product(
(-1)^n * (1 - n/(n - 1)), n = 2..infinity);
```

Aufgabe 36

```
> restart:
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> MWS := proc (f, a, b)
  local s, abl, w, t, p;

  s := (subs(x = b, f) - subs(x = a, f)) / (b - a);
  # oder s := (eval(f, x = b) - subs(f, x = a)) / (b-a);
  abl := diff(f, x);
  w := solve(abl = s, x);

  # Tangente
  t := subs(x = w, f) + subs(x = w, abl) * (x - w);

  p := plot([ f, t ], x = a..b);
  return w, t, p;
end proc;
> f := x^2 - 3 * x + 5;
> y, t, p := MWS(f, 1, 4);
> 'x[0]' = y; 'Tangente(x)' = t; p;

```

Aufgabe 37

```

> restart:
> with(VectorCalculus):
> k := t -> [
  -10*cos(t) - 2*cos(5*t) + 15*sin(2*t),
  15*cos(2*t) + 10*sin(t) - 2*sin(5*t),
  10*cos(3*t)
];
> #k := [-10*cos(t) -2*cos(5*t) + 15*sin(2*t), 15*cos(2*t) + 10*
sin(t)-2*sin(5*t),10*cos(3*t)];
> kk := diff(k(t), t);
> B := sqrt(simplify(sum(kk[j]^2, j = 1..3)));
> L := int(B, t = 0..2*Pi);
> evalf(L);

```

Aufgabe 38

```

> restart:
> K := 5;
> ang := k -> Pi/2 + 2*Pi*k/K;
> vec := (k, l) -> [ cos(ang(k)), sin(ang(k)) ] * l;
> # Punkte auf dem äußeren Kreis
> w1 := [ seq(vec(k, 1), k = 0 .. K) ];
> # Punkte auf dem inneren Kreis
> w2 := [ seq(vec(k + 1/2, 2/5), k = 0 .. K-1) ];
> # Vereinfacht
> with(ListTools):
> w := Interleave(w1, w2);

```

```
> # Von Hand  
> w := proc (k) if is(k, even) then w2[k/2] else w1[(k+1)/2] end  
if; end proc;  
> w := seq(w(k), k = 1..2*K+1);  
> plot([ w ], thickness = 2, scaling = constrained, axes='none');
```