Лабораторная работа №4

Хренникова Ангелина

Вариант №7

In[112]:=
```
tasks = {
    Sin[2 * x ^ 3] ^ 2 / x ^ 3
    , (x ^ 2 - 4) * Sin[(Pi * (x ^ 2)) / 6] / (x ^ 2 - 1)
    , Sqrt[Abs[3 * x ^ 3 + 2 * x ^ 2 - 10 * x]] / (4 * x)
    , 1 / 2 * Log[Sqrt[x ^ 2 + 1] / Sqrt[x ^ 2 - 1]] - 15 * x ^ 2
    , (x ^ 3 - x ^ 2 - x + 1) ^ (1 / 3) / Tan[x]
    , 2 * Log[(x - 1) / x] + 1
    , Log[x - 1] / (x - 1) ^ 2
}
```

Out[112]=
$$\left\{\frac{\text{Sin}\left[2\,x^3\right]^2}{x^3},\ \frac{\left(-4+x^2\right)\text{Sin}\left[\frac{\pi\,x^2}{6}\right]}{-1+x^2},\ \frac{\sqrt{\text{Abs}\left[-10\,x+2\,x^2+3\,x^3\right]}}{4\,x},\right.$$
$$\left.-15\,x^2+\frac{1}{2}\,\text{Log}\left[\frac{\sqrt{1+x^2}}{\sqrt{-1+x^2}}\right],\ \left(1-x-x^2+x^3\right)^{1/3}\,\text{Cot}[x],\ 1+2\,\text{Log}\left[\frac{-1+x}{x}\right],\ \frac{\text{Log}[-1+x]}{(-1+x)^2}\right\}$$

In[113]:=
```
getVariantForNumber [number_ , variationsQuo_ ] := (
    Module[{t},
        t = Mod[number , variationsQuo ];
        If[t ≠ 0
                , t
                , variationsQuo
            ]
    ]
)
```

In[114]:=
```
var = getVariantForNumber [28, Length[tasks]]
Print["Номер вашего задания: ", var]
```

Out[114]= 7

Номер вашего задания : 7

In[116]:=
```
f[y_] := tasks[[var]] /. x → y;
```

In[117]:=
```
f[x] // TraditionalForm
```

Out[117]//TraditionalForm=
$$\frac{\log(x-1)}{(x-1)^2}$$

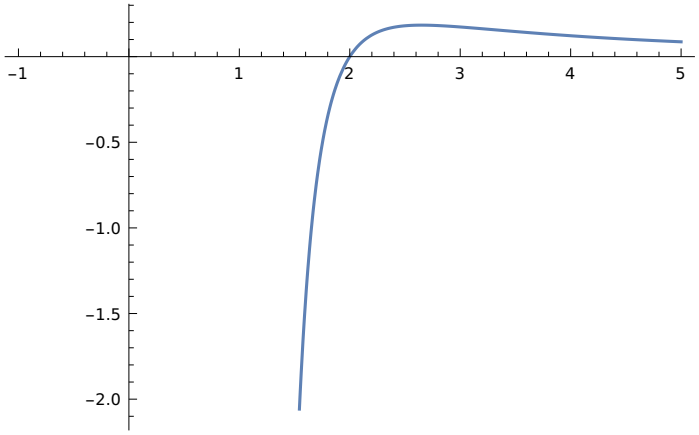
In[118]:=
```
f[-x] // TraditionalForm
```

Out[118]//TraditionalForm=

$$\frac{\log(-x-1)}{(-x-1)^2}$$

In[119]:=
```
(*График функции*)
Plot[
     f[x]
     , {x, -1, 5}
]
```

Out[119]=




```
(*Область определения функции: x > 1*)
```

In[120]:=
```
(*Приверка функции на четность или нечетность*)
res1 = f[x] == f[-x] // TautologyQ
res2 = f[x] + f[-x] == 0 // TautologyQ
If[res1, "Функция четная", Null]
If[res2, "Функция нечетная", Null]
If[Not[res1 || res2], "Функция прочая", Null]
```

Out[120]= False

Out[121]= False

Out[124]= Функция прочая

In[125]:=
```
(*Проверка на периодичность*)
FunctionPeriod [f[x], x]
(*Функция непериодическая *)
```

Out[125]= 0

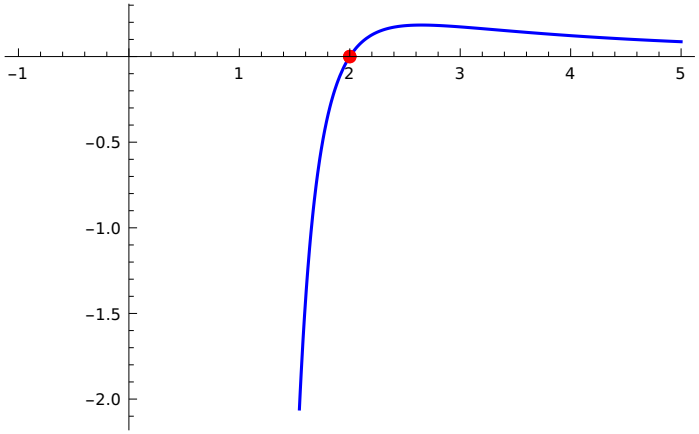
In[126]:=
```
(*Точки пересечения с осями координат*)
sols = Solve[f[x] == 0, x]
points = {x, 0} /. sols
```

Out[126]= {{x → 2}}

Out[127]= {{2, 0}}

In[128]:=
```
g1 = Plot[f[x], {x, -1, 5}, PlotStyle → Blue];
g2 = ListPlot[points, PlotStyle → {Red, PointSize[Large]}];
Show[{g1, g2}]
```

Out[130]=



In[131]:=
```
(*Промежутки возрастания и убывания*)
df = D[f[x], x]
sols = Solve[df == 0, x]
extremum = {x} /. sols
f[extremum]
f'[N[extremum] - 0.1]
f'[N[extremum] + 0.1]
```

Out[131]= $\frac{1}{(-1+x)^3} - \frac{2\,\mathrm{Log}[-1+x]}{(-1+x)^3}$

Out[132]= $\left\{\left\{x \to 1+\sqrt{e}\right\}\right\}$

Out[133]= $\left\{\left\{1+\sqrt{e}\right\}\right\}$

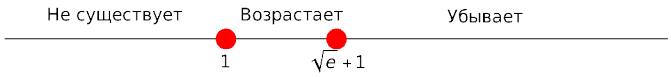
Out[134]= $\left\{\left\{\frac{1}{2e}\right\}\right\}$

Out[135]= {{0.0336883}}

Out[136]= {{-0.0220228}}

In[137]:=
```
Show[Graphics[Line[{{-1, 0}, {5, 0}}]],
  Graphics[{PointSize[0.03], Point[{1, 0}, VertexColors → Red]}],
  Graphics[Text[1, {1, -0.2}]],
  Graphics[Text["Не существует", {0, 0.2}]],
  Graphics[Text["Возрастает", {1.6, 0.2}]],
  Graphics[Text["Убывает", {3.35, 0.2}]],
  Graphics[{PointSize[0.03], Point[{2, 0}, VertexColors → Red]}],
  Graphics[Text[Sqrt[e] + 1, {2, -0.2}]]
  ]
```

Out[137]=



In[138]:=
```
(*Промежутки  знакапостоянства *)
f[2]
f[1.9]
f[2.1]
```

Out[138]= 0

Out[139]= -0.130075

Out[140]= 0.0787687

In[141]:=
```
Show[
  Graphics[Line[{{-1, 0}, {4, 0}}]],
  Graphics[{PointSize[0.03], Point[{1, 0}, VertexColors → Red]}],
  Graphics[Text[1, {1, -0.2}]],
  Graphics[Text["Не существует", {0, 0.2}]],
  Graphics[{PointSize[0.03], Point[{2, 0}, VertexColors → Red]}],
  Graphics[Text[2, {2, -0.2}]],
  Graphics[Text[Style["-", FontSize → Scaled[0.1]], {1.5, 0.3}]],
  Graphics[Text[Style["+", FontSize → Scaled[0.1]], {3, 0.3}]]
]
```

Out[141]=

In[142]:=
```
(*Точки экстремума + асимптоты*)
Limit[f[x], x → Infinity]
Limit[f[x], x → -Infinity]
Limit[f[x] / x, x → Infinity]
Limit[f[x], x → 1]
```

Out[142]= 0

Out[143]= 0

Out[144]= 0

Out[145]= $-\infty$

In[146]:=
```
Plot[f[x], {x, 0.5, 5}, GridLines → {{1, 0}, {0, 0}},
 GridLinesStyle → Directive[Thick, Red]]
```

Out[146]=