Practical - 1

To solve 1st Order Linear differential equation and plotting its graph for particular solution

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Question - 1 : `y'[x] + 2*y[x]*Sin[2x] == 2*e^Cos[2x]`

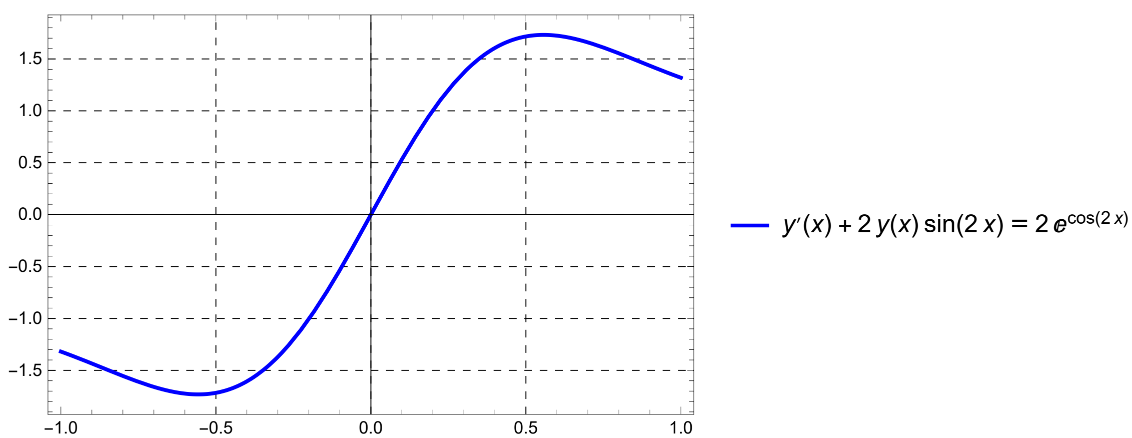
In[ ]:=

```
DSolve[{y'[x] + 2 * y[x] * Sin[2 x] == 2 * e^Cos[2 x]}, y[x], x]
sol1 = DSolve[{y'[x] + 2 * y[x] * Sin[2 x] == 2 * e^Cos[2 x], y[0] == 0}, y[x], x]
Plot[y[x] /. sol1, {x, -1, 1}, PlotLegends → {y'[x] + 2 * y[x] * Sin[2 x] == 2 * e^Cos[2 x]},
 PlotStyle → {{Blue, Thickness[0.006]}}, Frame → True,
 GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
```

Out[ ]= $\{\{y[x] \to 2\, e^{\text{Cos}[2x]}\, x + e^{\text{Cos}[2x]}\, c_1\}\}$

Out[ ]= $\{\{y[x] \to 2\, e^{\text{Cos}[2x]}\, x\}\}$

Out[ ]=



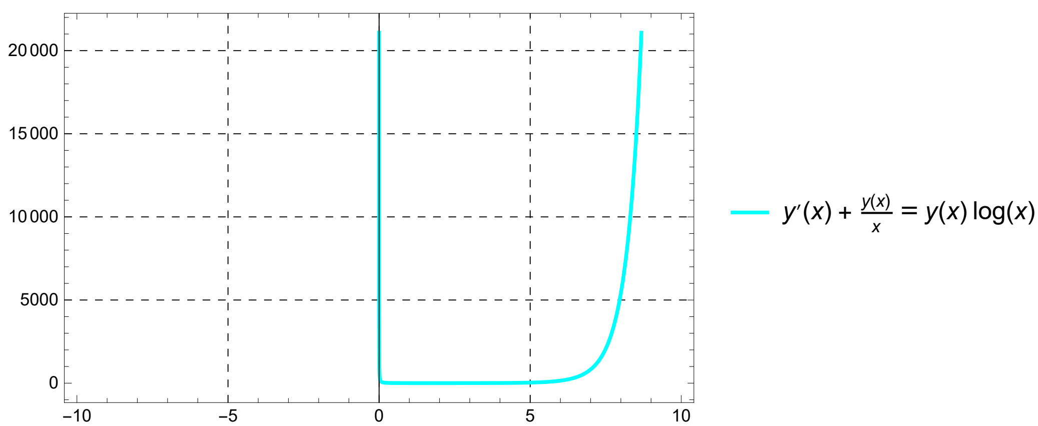
Question -2 : y'[x] + $\frac{y[x]}{x}$ == y[x] * Log[x]

In[◦]:=
```
eq1 = y'[x] + y[x]/x == y[x] * Log[x]
DSolve[{y'[x] + y[x]/x == y[x] * Log[x]}, y[x], x]
sol2 = DSolve[{y'[x] + y[x]/x == y[x] * Log[x], y[4] == 9}, y[x], x]
Plot[y[x] /. sol2, {x, -10, 10}, PlotLegends → {eq1},
 PlotStyle → {{Cyan, Thickness[0.006]}, {Red, Thickness[0.01]}}, Frame → True,
 GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
```

Out[◦]= $\frac{y[x]}{x} + y'[x] == \text{Log}[x]\, y[x]$

Out[◦]= $\left\{\left\{y[x] \to \frac{e^{-x+x\,\text{Log}[x]}\, c_1}{x}\right\}\right\}$

Out[◦]= $\left\{\left\{y[x] \to \frac{9}{64} e^{4-x} x^{-1+x}\right\}\right\}$

Out[◦]=


Question 3 : y’[x] * Tan[x] == 2*y[x] -8

In[ ]:=

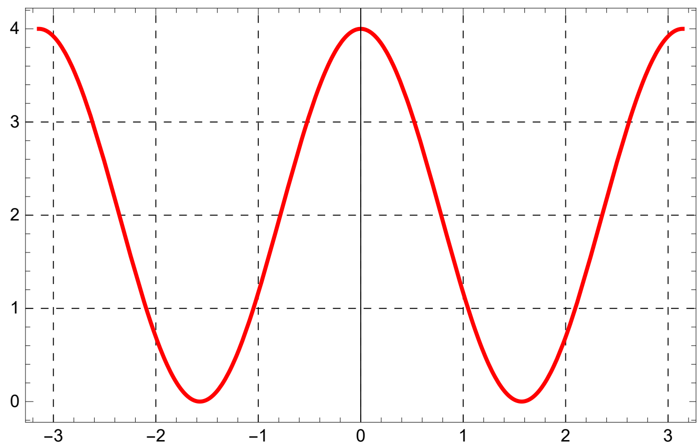
```
eq1 = y'[x] * Tan[x] == 2 * y[x] - 8
DSolve[{y'[x] * Tan[x] == 2 * y[x] - 8}, y[x], x]
Sol3 = DSolve[{y'[x] * Tan[x] == 2 * y[x] - 8, y[π/2] == 0}, y[x], x]
Plot[y[x] /. Sol3, {x, -π, π},
 PlotStyle → {{Red, Thickness[0.006]}, {Red, Thickness[0.01]}}, Frame → True,
 GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed],
 PlotStyle → {{Red, Thickness[0.006]}, {Red, Thickness[0.01]}}, Frame → True,
 GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
```

Out[ ]= $\text{Tan}[x]\, y'[x] == -8 + 2\, y[x]$

Out[ ]= $\{\{y[x] \to 4 + c_1 \text{Sin}[x]^2\}\}$

Out[ ]= $\{\{y[x] \to -4\, (-1 + \text{Sin}[x]^2)\}\}$

Out[ ]=



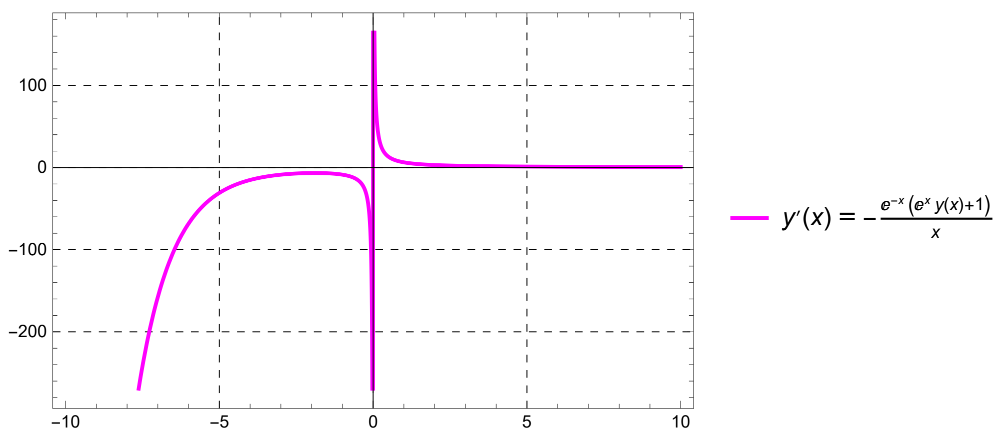
Question 4: y'[x] == -((1+y[x]*e^x)/(x* e^x))

In[∘]:=
```
eq1 = y'[x] == -((1 + y[x] * e^x)/(x * e^x))
sol4 = DSolve[{y'[x] == -((1 + y[x] * e^x)/(x * e^x))}, y[x], x]
sol4 = DSolve[{y'[x] == -((1 + y[x] * e^x)/(x * e^x)), y[3] == 2}, y[x], x]
Plot[y[x] /. sol4, {x, -10, 10}, PlotLegends → {eq1},
 PlotStyle → {{Magenta, Thickness[0.006]}, {Red, Thickness[0.01]}},
 Frame → True, GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
```

Out[∘]= $y'[x] == -\frac{e^{-x}\left(1 + e^x y[x]\right)}{x}$

Out[∘]= $\left\{\left\{y[x] \to \frac{e^{-x}}{x} + \frac{c_1}{x}\right\}\right\}$

Out[∘]= $\left\{\left\{y[x] \to \frac{e^{-3-x}\left(e^3 - e^x + 6\, e^{3+x}\right)}{x}\right\}\right\}$

Out[∘]=


Question 5: y’[x]-y[x]*Tan[x]==-y[x]*Sec[x]

In[ ]:=
```
eq1 = y'[x] - y[x] * Tan[x] == -y[x] * Sec[x]
DSolve[{y'[x] - y[x] * Tan[x] == -y[x] * Sec[x]}, y[x], x]
sol5 = DSolve[{y'[x] - y[x] * Tan[x] == -y[x] * Sec[x], y[0] == 9}, y[x], x]
Plot[y[x] /. sol5, {x, -10, 10}, PlotLegends → {eq1},
 PlotStyle → {{Brown, Thickness[0.006]}, {Red, Thickness[0.01]}}, Frame → True,
 GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
```

Out[ ]= $-\text{Tan}[x]\, y[x] + y'[x] == -\text{Sec}[x]\, y[x]$

Out[ ]= $\left\{\left\{y[x] \to \frac{\mathbb{C}_1}{\left(\text{Cos}\left[\frac{x}{2}\right] + \text{Sin}\left[\frac{x}{2}\right]\right)^2}\right\}\right\}$

Out[ ]= $\left\{\left\{y[x] \to \frac{9}{\left(\text{Cos}\left[\frac{x}{2}\right] + \text{Sin}\left[\frac{x}{2}\right]\right)^2}\right\}\right\}$

Out[ ]=