Yohan Lee Lab 1

Problem 1

Define function f

In[1]:=
```
f[x_] := 1 / (1 + x^2)
```

In[2]:=
```
Function[x, 1/(1 + x^2)]
```

Out[2]=
$$\text{Function}\left[x, \frac{1}{1+x^2}\right]$$

Evaluate third derivative of f at x=2

In[3]:=
```
f'''[2]
```

Out[3]=
$$-\frac{144}{625}$$

Problem 2

Function 1 integrated over interval [0, 2]

In[4]:=
```
Integrate[x^3 * Exp[x], {x, 0, 2}]
```

Out[4]=
$$2\left(3+e^2\right)$$

Function 2 integrated over invertal [0, Pi]

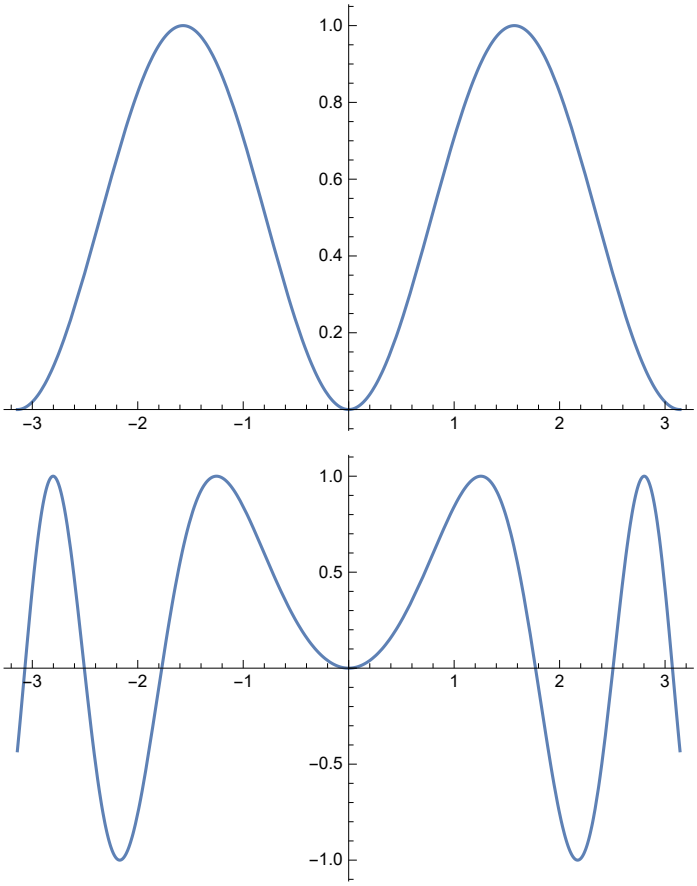
In[16]:=
```
Integrate[Sin[x], {x, 0, Pi}]
```

Out[16]=
$$2$$

Problem 3

Graph both functions in separate plots

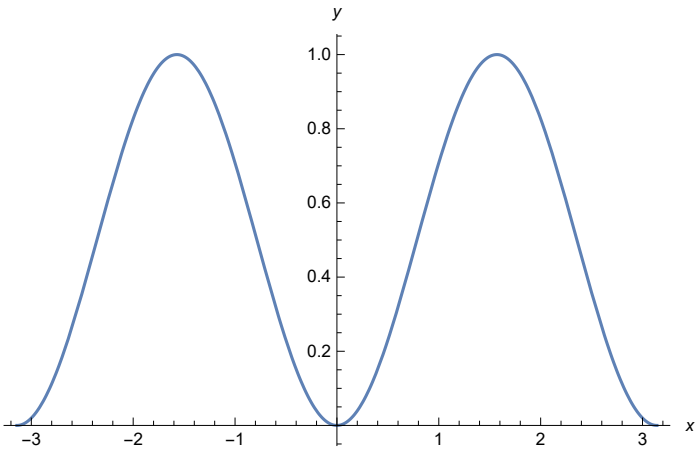
```
Plot[(Sin[x])^2, {x, -Pi, Pi}]
Plot[Sin[x^2], {x, -Pi, Pi}]
```



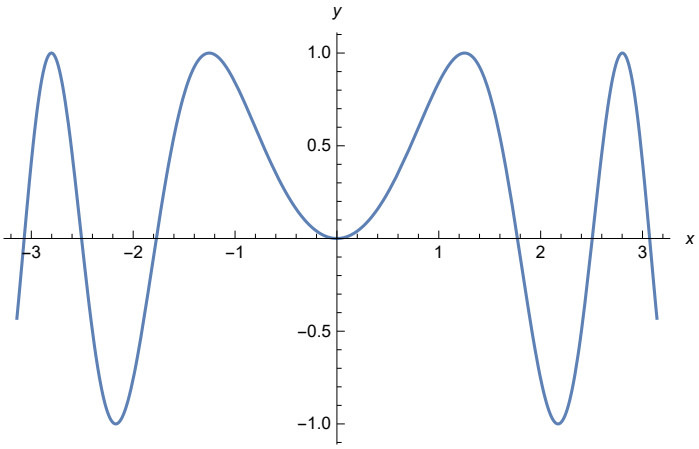
Problem 4

Graph both functions with axis labels

```
Plot[(Sin[x])^2, {x, -Pi, Pi}, AxesLabel → {x, y}]
```




```
Plot[(Sin[x^2]), {x, -Pi, Pi}, AxesLabel → {x, y}]
```



Problem 5

Define function g

In[12]:=
```
g[x_] := 1 / (√(1 - x^2))
```

In[13]:=
```
Function[x, 1/√(1 - x^2)]
```

Out[13]=
```
Function[x, 1/√(1 - x^2)]
```

Find value of derivative of g evaluated at x=1/2

In[14]:=
```
Function[x, 1/Sqrt[1 - x^2]]'
```

Out[14]=
```
Function[x, x/(Sqrt[1 - x^2] Sqrt[1 - x^2]^2)]
```

In[15]:=
```
Function[x, x/(Sqrt[1 - x^2] Sqrt[1 - x^2]^2)][1/2]
```

Out[15]=
$$\frac{4}{3\sqrt{3}}$$

Find antiderivative of g

In[17]:=
```
Integrate[g[x], x]
```

Out[17]=
```
ArcSin[x]
```

Compute integral of g on interval (0, 1)

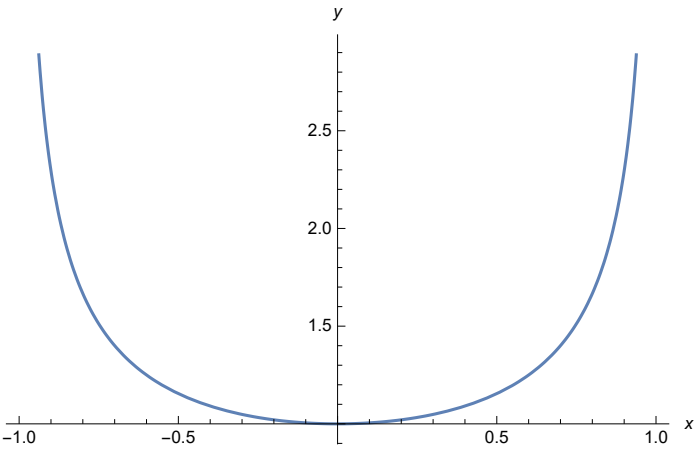
In[18]:=
```
Integrate[g[x], {x, 0, 1}]
```

Out[18]=
$$\frac{\pi}{2}$$

Plot g on the interval (-1, 1)

In[19]:=
```
Plot[g[x], {x, -1, 1}, AxesLabel → {x, y}]
```

Out[19]=



Problem 6

Define function

In[21]:=
```
Clear[f]
```

In[22]:=
```
f[x_] := (1 - Tan[x]) / (Sin[x] - Cos[x])
```

In[23]:=
```
Function[x, (1 - Tan[x])/(Sin[x] - Cos[x])]
```

Out[23]=
$$\text{Function}\left[x, \frac{1-\text{Tan}[x]}{\text{Sin}[x]-\text{Cos}[x]}\right]$$

Compute limit as x->Pi/4

In[25]:=
```
Limit[f[x], x → Pi/4]
```

Out[25]=
$$-\sqrt{2}$$

Problem 7

Define function

In[26]:=
```
Clear[f]
```

In[27]:=
```
f[x_] := Cos[x + 1] + Log[x - 1] + x * Exp[x^2 + 1]
```

In[28]:=
```
Function[x, Cos[x + 1] + Log[x - 1] + x Exp[x^2 + 1]]
```

Out[28]=
$$\text{Function}\left[x, \text{Cos}[x+1]+\text{Log}[x-1]+x\,\text{Exp}\left[x^2+1\right]\right]$$

Compute fourth derivative of f

In[29]:=
```
f''''[x]
```

Out[29]=
$$-\frac{6}{(-1+x)^4}+60\,e^{1+x^2}x+80\,e^{1+x^2}x^3+16\,e^{1+x^2}x^5+\text{Cos}[1+x]$$

Compute integral of f on interval [2,4]

In[30]:=
```
Integrate[f[x], {x, 2, 4}]
```

Out[30]=
$$-2+\frac{1}{2}e^5\left(-1+e^{12}\right)+\text{Log}[27]-\text{Sin}[3]+\text{Sin}[5]$$

In[31]:=
```
N[-2 + 1/2 e^5 (-1 + e^12) + Log[27] - Sin[3] + Sin[5]]
```

Out[31]=
$$1.20774\times 10^7$$