CHAPTER 12 ASSIGNMENT

Q1. Plot the following graphs.

a). f (x) = x / (1 + x ^ 2)

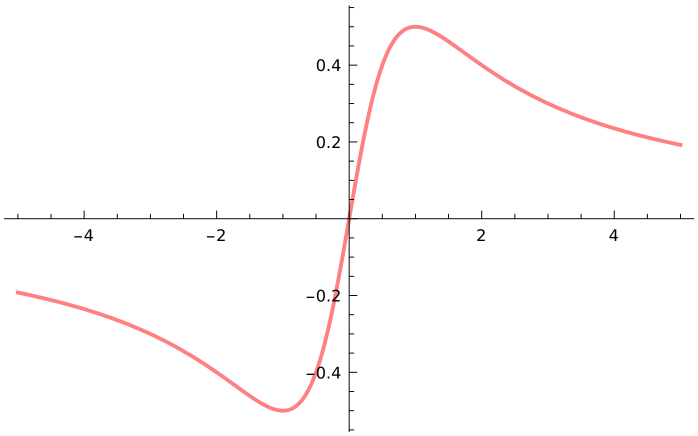
In[1]:=

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

In[3]:=

```
Plot[f[x], {x, -5, 5}, PlotStyle → {Pink, Thick}]
```

Out[3]=



b). f (x) = xSin (1 / x)

In[4]:=

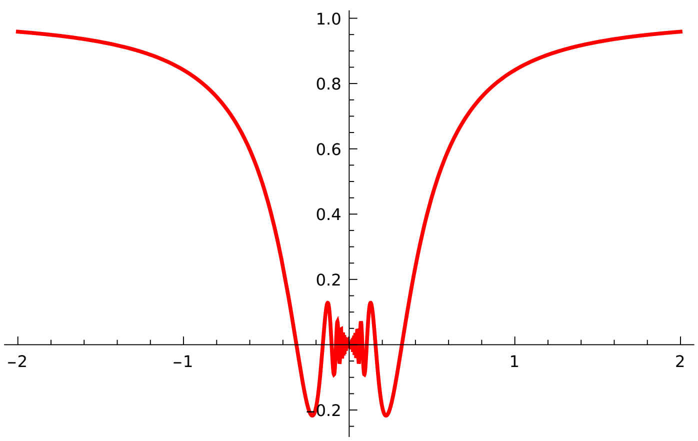
```
g[x_] := x Sin[1 / x]
```

In[5]:=

In[6]:=

```
Plot[g[x], {x, -2, 2}, PlotStyle → {Red, Thick}]
```

Out[6]=



c). h (x, y) = Cos (x) + Sin (y)

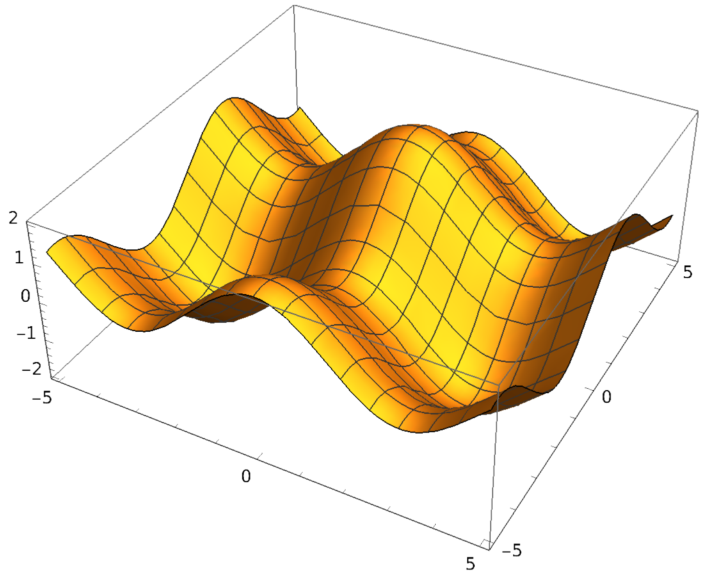
In[7]:=

```
h[x_, y_] := Cos[x] + Sin[y]
```

In[8]:=

```
Plot3D[h[x, y], {x, -5, 5}, {y, -5, 5}]
```

Out[8]=



d).i (x, y) = xy / (x ^ 2 + y ^ 2)

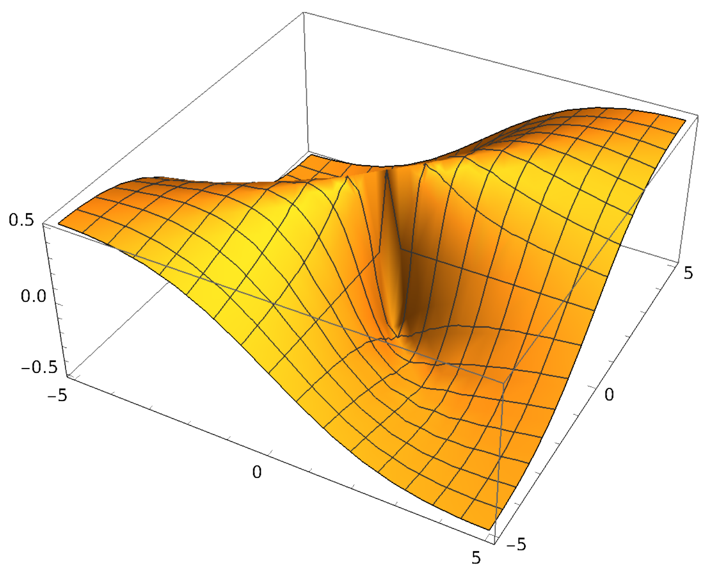
In[9]:=

```
i[x_, y_] := x y / (x ^ 2 + y ^ 2)
```

In[11]:=

```
Plot3D[i[x, y], {x, -5, 5}, {y, -5, 5}]
```

Out[11]=



In[15]:=

```
ClearAll[f, g, h, i]
```

Q2). Let f (x) = x / (1 / x ^ 2).

In[72]:=

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

a). Find f ' (x) and f ' ' (x).

In[73]:=

```
f '[x]
```

Out[73]=

$$-\frac{2x^2}{\left(1+x^2\right)^2}+\frac{1}{1+x^2}$$

In[74]:=

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

Out[74]=

$$\frac{8x^3}{\left(1+x^2\right)^3}-\frac{6x}{\left(1+x^2\right)^2}$$

b).Find f ' (-1) and f ' ' (0)

In[75]:=

```
f '[-1]
```

Out[75]= 0

In[76]:=

```
f '[0]
```

Out[76]= 1

c).Find f ' ' (0) and f ' ' (1)

In[77]:=

```
f ''[0]
```

Out[77]= 0

In[78]:=

```
f ''[1]
```

Out[78]=

$$-\frac{1}{2}$$

In[25]:=

```
ClearAll[f]
```

Q3).Find the prime fatorization of the following integers .

a). 3, 527, 218, 133, 309, 949, 276, 293

In[10]:=

```
FactorInteger [3 527 218 133 309 949 276 293 ]
```

Out[10]= {{15 013 , 2}, {25 013 , 3}}

b) .471, 945, 325, 930, 166, 269, 281

In[11]:=
```
FactorInteger [471 945 325 930 166 269 281 ]
```
Out[11]=
```
{{3, 1}, {367, 1}, {575 303, 1}, {745 088 279 027, 1}}
```

Q4). Compute each expression .

a) .3 ^ 6 mod7

In[42]:=

```
Mod[3 ^ 6, 7]
```
Out[42]=
```
1
```

b) .6 ^ 10 mod 11

In[43]:=
```
Mod[6 ^ 10, 11]
```
Out[43]=
```
1
```

c) .7 ^ 20 mod21

In[44]:=
```
Mod[7 ^ 20, 21]
```
Out[44]=
```
7
```

d) .7 ^ 22 mod23

In[45]:=
```
Mod[7 ^ 22, 23]
```
Out[45]=
```
1
```

Q8). Let M = [{1, 1}, {1, 0}]

In[49]:=
```
M = {{1, 1}, {1, 0}}
```
Out[49]=
```
{{1, 1}, {1, 0}}
```

a). Find M ^ 2, M ^ 3 ....M ^ 10.

In[50]:=

```
MatrixPower [M, 2]
```
Out[50]=
```
{{2, 1}, {1, 1}}
```

In[51]:=
```
MatrixPower [M, 3]
```
Out[51]=
```
{{3, 2}, {2, 1}}
```

In[52]:=
```
MatrixPower [M, 4]
```
Out[52]=
```
{{5, 3}, {3, 2}}
```

In[53]:=
```
MatrixPower[M, 5]
```
Out[53]= {{8, 5}, {5, 3}}

In[54]:=
```
MatrixPower[M, 6]
```
Out[54]= {{13, 8}, {8, 5}}

In[55]:=
```
MatrixPower[M, 7]
```
Out[55]= {{21, 13}, {13, 8}}

In[56]:=
```
MatrixPower[M, 8]
```
Out[56]= {{34, 21}, {21, 13}}

In[57]:=
```
MatrixPower[M, 9]
```
Out[57]= {{55, 34}, {34, 21}}

In[58]:=
```
MatrixPower[M, 10]
```
Out[58]= {{89, 55}, {55, 34}}

b).Find the 100 th Fibonacci number .

In[59]:=

```
f[0] = 1;
f[1] = 1;
f[n_] := f[n] = f[n - 2] + f[n - 1]
```

In[62]:=
```
f[100]
```
Out[62]= 573 147 844 013 817 084 101

Q9). Solve the following equations .

a).Find x

In[81]:=

```
Solve[x^2 + x == 1, x]
```

Out[81]= $\left\{\left\{x \to \frac{1}{2}\left(-1-\sqrt{5}\right)\right\}, \left\{x \to \frac{1}{2}\left(-1+\sqrt{5}\right)\right\}\right\}$

b).Find x.

In[64]:=
```
Solve[x^2 + x == -1, x]
```
Out[64]= $\left\{\left\{x \to -(-1)^{1/3}\right\}, \left\{x \to (-1)^{2/3}\right\}\right\}$

c). Find x and y.

In[65]:=

```
Solve[{4 x - 3 y == 5, 6 x + 2 y == 14}, {x, y}]
```

Out[65]= {{x → 2, y → 1}}

d). Find x, y, t .

In[66]:=

```
Solve[{-2 x - 2 y + 3 z + t == 8, -3 x + 0 y - 6 z + t == -19,
  6 x - 8 y + 6 z + 5 t == 47, x + 3 y - 3 z - t == -9}, {x, y, z, t}]
```

Out[66]= {{x → 2, y → 1, z → 3, t → 5}}

Q10). Solve for ' r ' in the given equation .

In[67]:=

```
Solve[250 Exp[1.0 r] + 300 Exp[0.75 r] + 350 Exp[0.5 r] + 400 Exp[0.25 r] == 1365 , r]
```

Solve : Solve was unable to solve the system with inexact coefficients . The answer was obtained by solving a corresponding exact system and numericizing the result .

Out[67]=

$$\left\{\left\{r \to \boxed{4.\ ((0.598729 + 3.14159\,i) + (0. + 6.28319\,i)\,c_1)\ \text{ if }\ c_1 \in \mathbb{Z}}\right\},\right.$$
$$\left\{r \to \boxed{4.\ (0.021026 + (0. + 6.28319\,i)\,c_1)\ \text{ if }\ c_1 \in \mathbb{Z}}\right\},$$
$$\left\{r \to \boxed{4.\ ((0.538847 - 1.68817\,i) + (0. + 6.28319\,i)\,c_1)\ \text{ if }\ c_1 \in \mathbb{Z}}\right\},$$
$$\left.\left\{r \to \boxed{4.\ ((0.538847 + 1.68817\,i) + (0. + 6.28319\,i)\,c_1)\ \text{ if }\ c_1 \in \mathbb{Z}}\right\}\right\}$$