CHAPTER 12 ASSIGNMENT

Q1. Plot the following graphs.

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

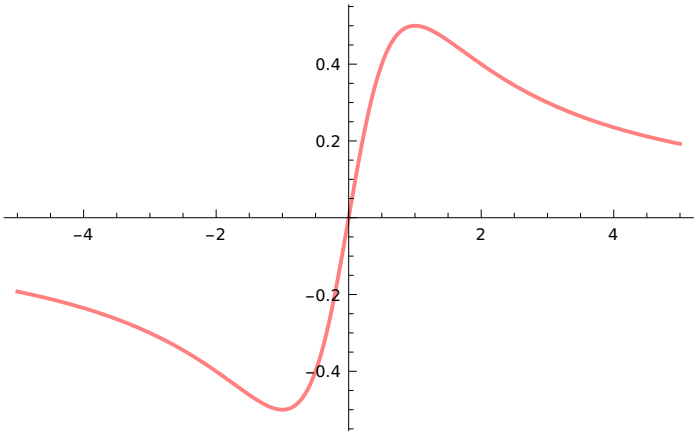
In[1]:=

```
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]:=

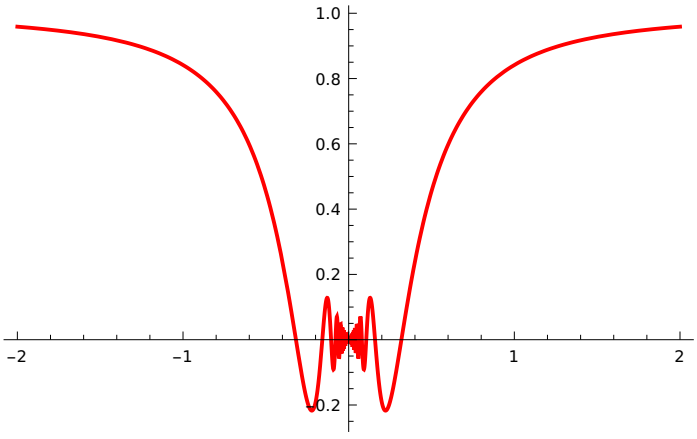
```
g[x_] := x Sin[1 / x]
```

In[5]:=

In[6]:=

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

Out[6]=

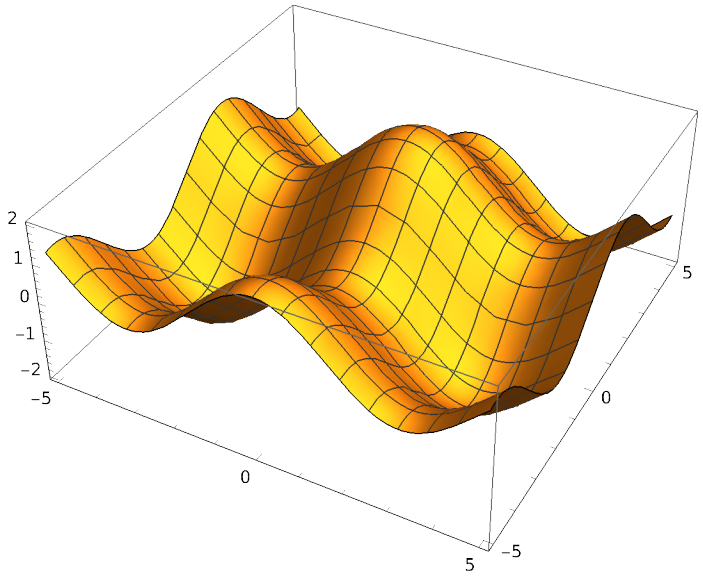


c). h(x, y) = Cos (x) + Sin (y)

In[7]:=
```
h[x_, y_] := Cos[x] + Sin[y]
```

In[8]:=
```
Plot3D[h[x, y], {x, -5, 5}, {y, -5, 5}]
```

Out[8]=

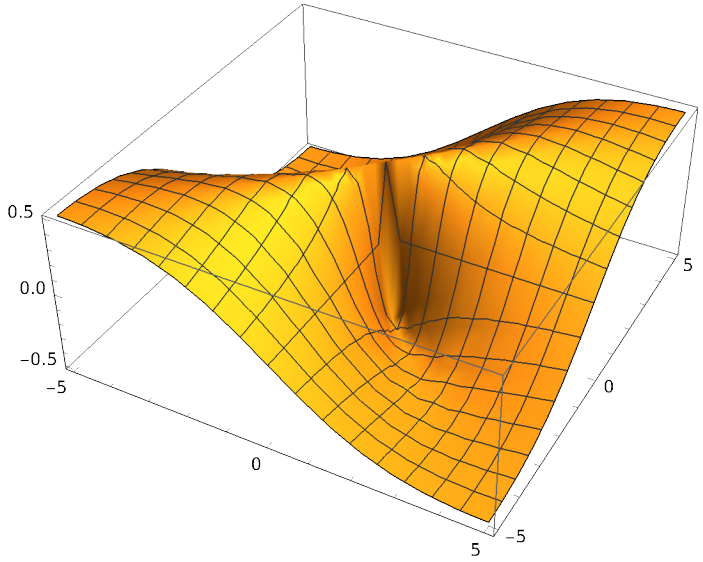


d). i (x, y) = xy / (x ^ 2 + y ^ 2)

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

In[74]:=
```
f''[x]
```

Out[74]=
$$\frac{8\,x^3}{\left(1+x^2\right)^3}-\frac{6\,x}{\left(1+x^2\right)^2}$$

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]= $\left\{\{x \to -(-1)^{1/3}\}, \{x \to (-1)^{2/3}\}\right\}$

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[21]:=
```
FindRoot[250 Exp[1.0 r] + 300 Exp[0.75 r] + 350 Exp[0.5 r] + 400 Exp[0.25 r] == 1365, {r, 0}]
```
Out[21]= {r → 0.084104}

Q11).

In[1]:=
```
mysqrt[n_] := Module[{i = g, g = 1}, While[i ≤ 20, g = (g + n / g) / 2; i = i + 1]; g]
```
In[2]:=
```
N[mysqrt[2], 6]
```
Out[2]= 1.00000

In[3]:=
```
N[Sqrt[2], 6]
```
Out[3]= 1.41421

In[4]:=
```
N[mysqrt[3]]
```
Out[4]= 1.

Q12).

a).

In[5]:=
```
collatz[n_] := Which[n == 1, collatz[n] = 0, EvenQ[n],
collatz[n] = 1 + collatz[n / 2], OddQ[n], collatz[n] = 1 + collatz[3 * n + 1]];
```

b).

In[6]:=

```
collatz[1]
```

Out[6]= 0

In[7]:=

```
collatz[2]
```

Out[7]= 1

In[8]:=

```
collatz[6]
```

Out[8]= 8

In[9]:=

```
collatz[27]
```

Out[9]= 111