MATH 152 Lab 1

Put team members' names and section number here.

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Section 542

In [1]:
```
from sympy import *
from sympy.plotting import (plot,plot_parametric)
```

Question 1

1a

In [2]:
```
#start code here
a, b = symbols("a b")
print(((sin(a)**2 + cos(a)**2) / (b**2 + 1)).subs([(a, 1.54), (b, 3.78)]))
```

```
0.0654090683132310
```

1b

In [3]:
```
#start code here
print(((sin(a)+cos(a))**2 / (b**2 + 1)).subs([(a, 1.54), (b, 3.78)]))
```

```
0.0694352396215375
```

The answers to (a) and (b) are not equal. The expression in part (a) can be simplified to 1 / (b**2 + 1) using the identity sin(x)**2 + cos(x)**2 = 1

Question 2

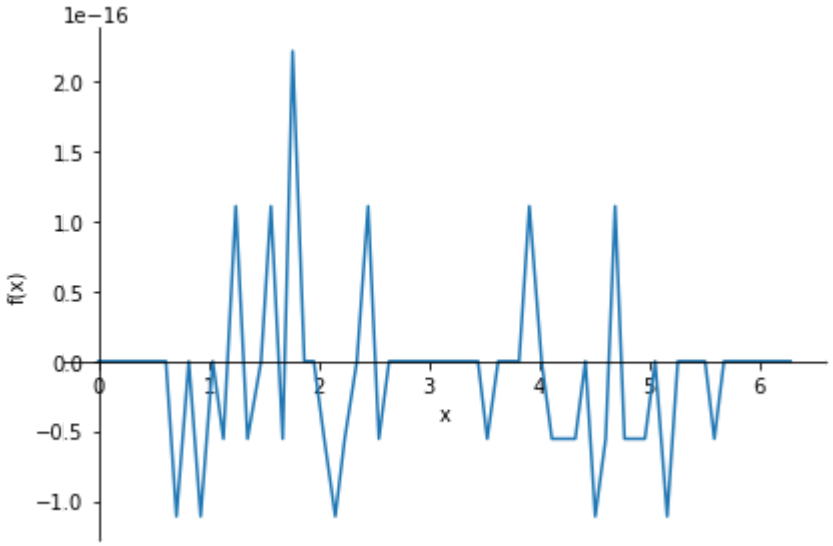
2a

In [4]:
```
#start code here
x = symbols("x")
print((sin(x)**2).subs(x, 3*pi / 4) == ((1 - cos(2 * x)) / 2).subs(x, 3*pi / 4))
```

```
True
```

2b

In [5]:
```
#start code here
plot((sin(x)**2 - ((1 - cos(2 * x)) / 2)), (x, 0, 2 * pi))
print("y does not equal 0 for all x because the division of floating point numbers is
```

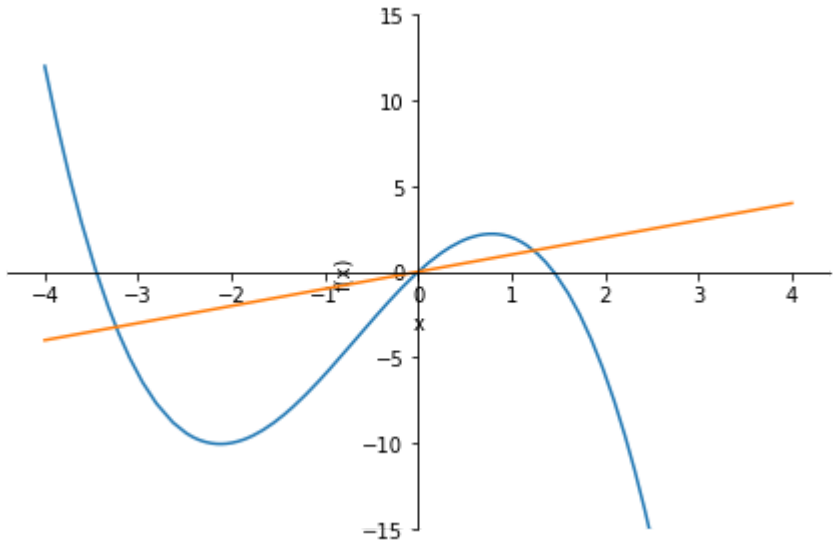



```
y does not equal 0 for all x because the division of floating point numbers is not co
mpletely accurate, hence the small fluctuations around the x axis.
```

Question 3

3a

In [6]:
```
#start code here
fx = -1 * x**3 - 2 * x**2 + 5*x
gx = x
plot(fx, gx, (x, -4, 4), ylim=(-15, 15))
```



Out[6]:
```
<sympy.plotting.plot.Plot at 0x175dbe73fa0>
```

3b

In [7]:
```
#start code here
bounds = solve(fx - gx, x)
area = Abs(integrate(fx, (x, bounds[2], bounds[0])) - integrate(gx, (x, bounds[2], bou
print(f"Exact area: {area}, Approximate area: {N(area)}")
```

```
Exact area: -(1 + sqrt(5))**4/4 + 2*(1 - sqrt(5))**3/3 - (1 - sqrt(5))**4/4 + 2*(1 -
sqrt(5))**2 + 2*(1 + sqrt(5))**2 + 2*(1 + sqrt(5))**3/3, Approximate area: 17.3333333
333333
```

Question 4

4a

In [8]:
```
#start code here
u = symbols("u")
fx = 5 * x**2 * (x**3 - 7) ** (1/2)
f = 5/3 * u**(1/2)
print(f"{integrate(f, u)} + C")
```

```
1.11111111111111*u**1.5 + C
```

4b

In [9]:
```
#start code here
print(integrate(fx, x, manual=True))
print(integrate(f, u).subs(u, x**3 - 7))
print(integrate(fx, x, manual=True) == integrate(f, u).subs(u, x**3 - 7))
```

```
1.11111111111111*(x**3 - 7)**1.5
1.11111111111111*(x**3 - 7)**1.5
True
```

4c

In [10]:
```
#start code here
print(f"Exact: (5/3 * (3**3 - 7)**(1/2)) - (5/3 * (2**3 - 7)**(1/2)), Approximate: {(i
```

```
Exact: (5/3 * (3**3 - 7)**(1/2)) - (5/3 * (2**3 - 7)**(1/2)), Approximate: 98.2696878
888795
```

4d

In [11]:
```
#start code here
print(integrate(fx, (x, 2, 3), manual=True))
```

```
98.2696878888795
```

In [ ]:
```

```