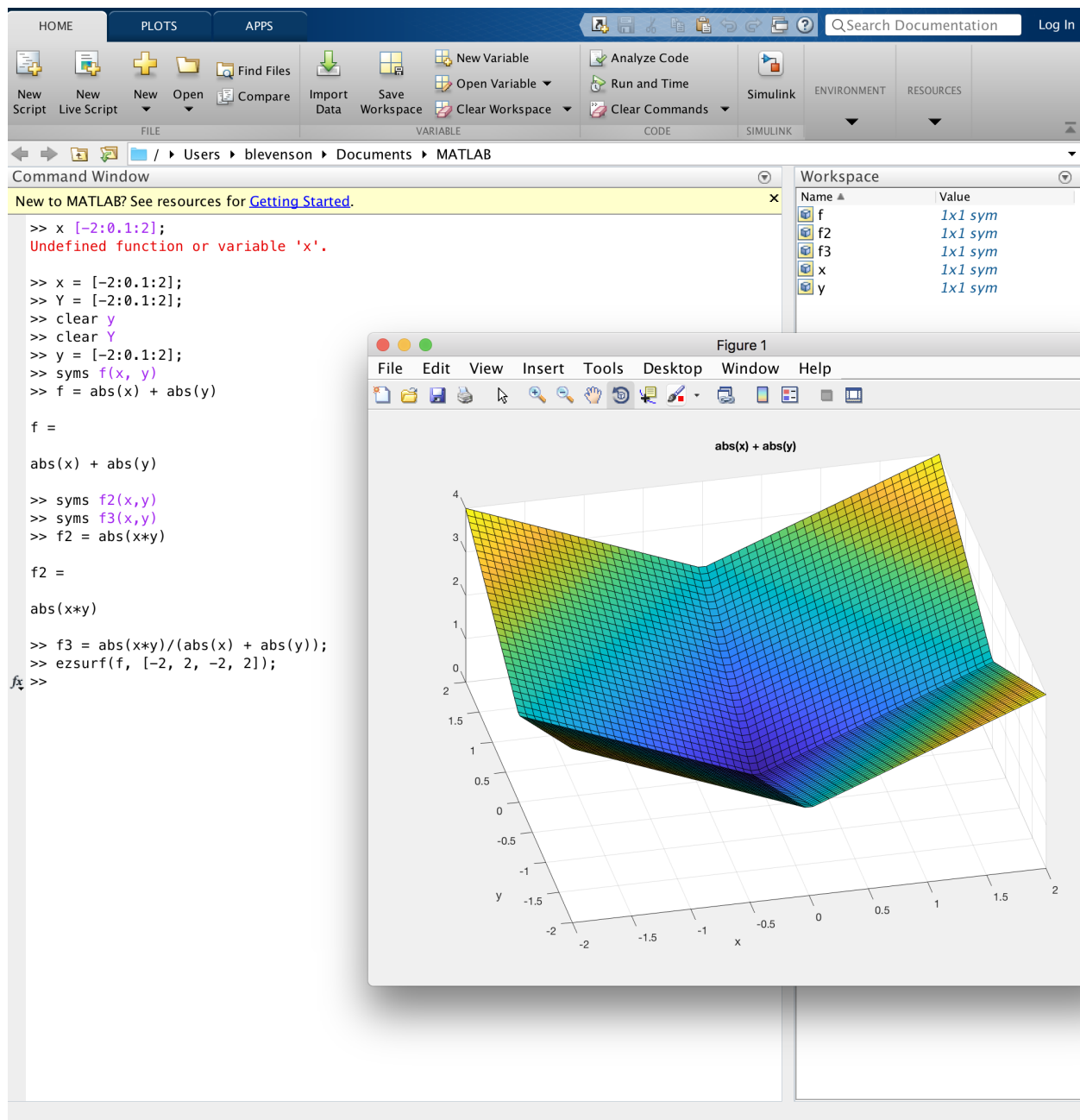
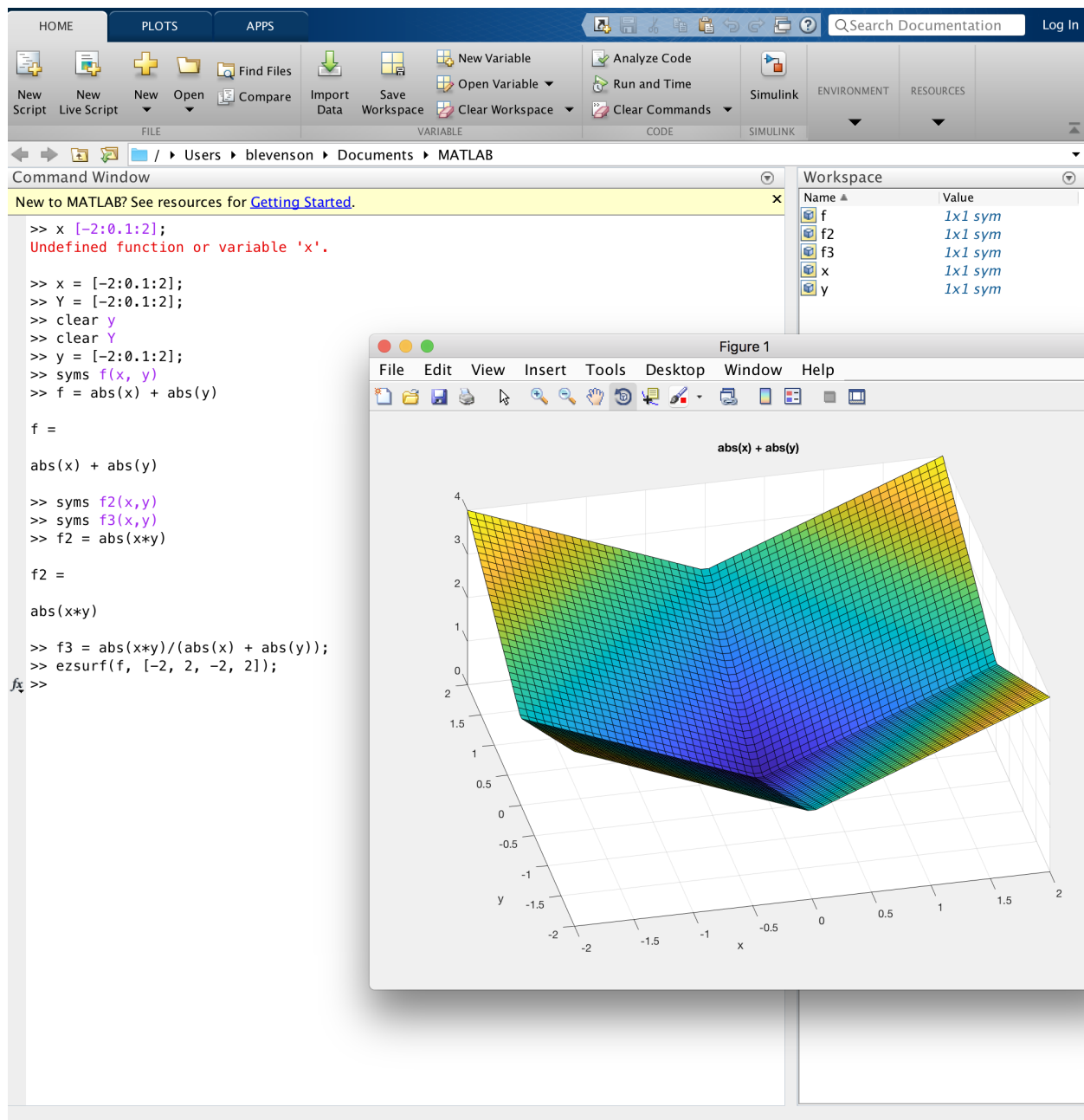
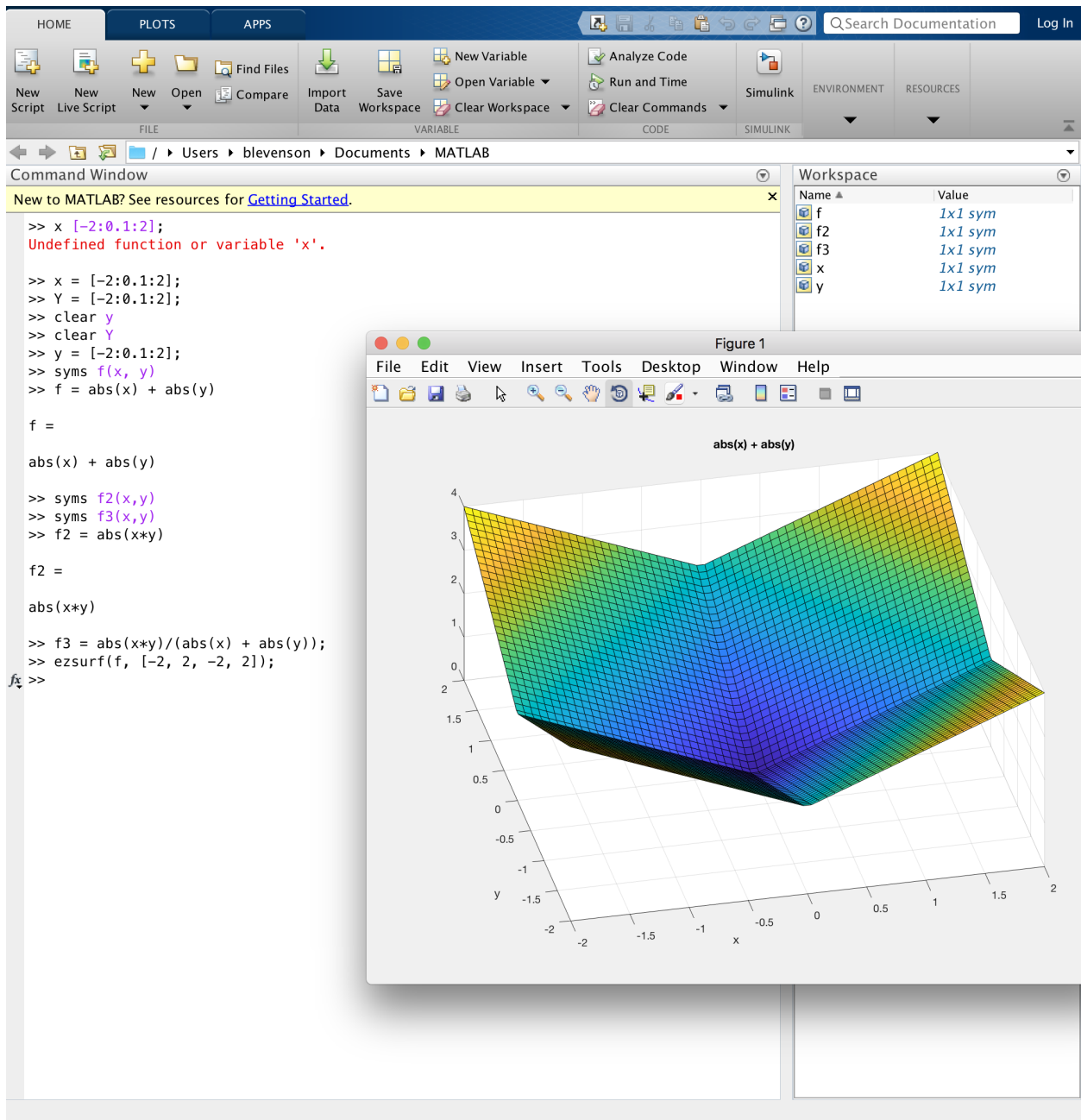


Brett Levenson, Andy Poulos, Rishabh Shah, John Stefan
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Lab 2

Exercise One:







Exercise Two:

```
>> limit(f3, x, 0)
```

```
ans =
```

```
0
```

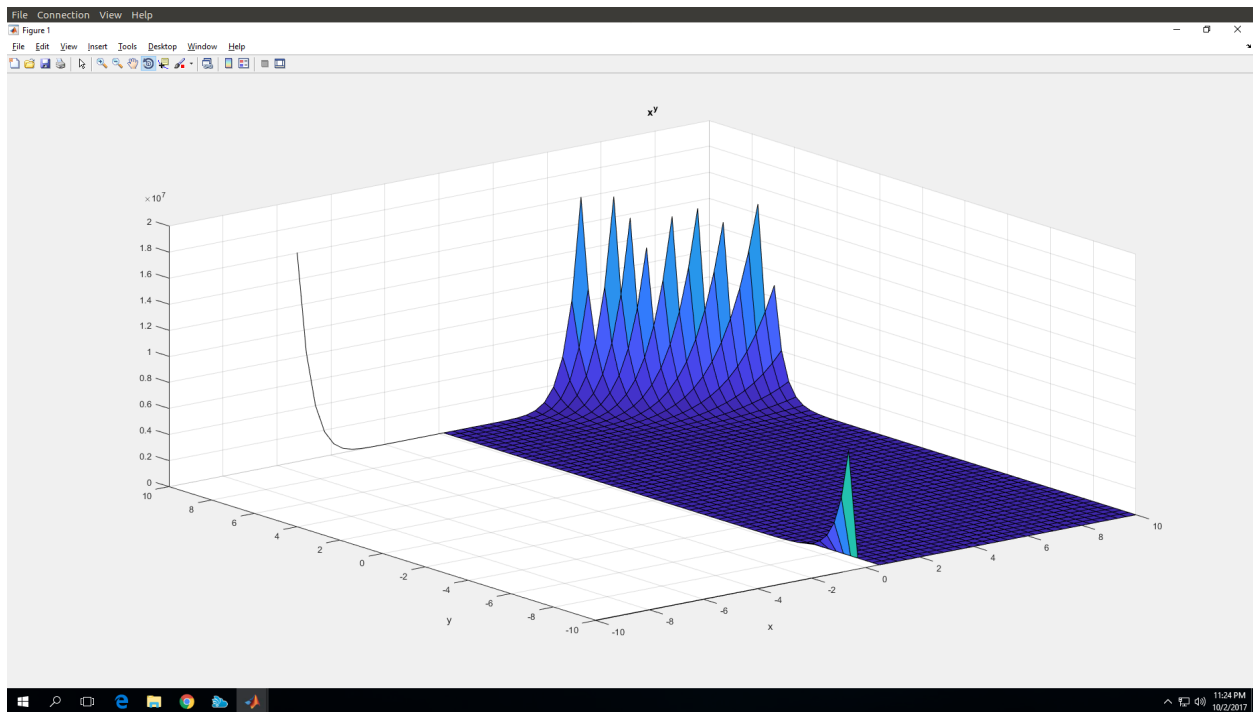
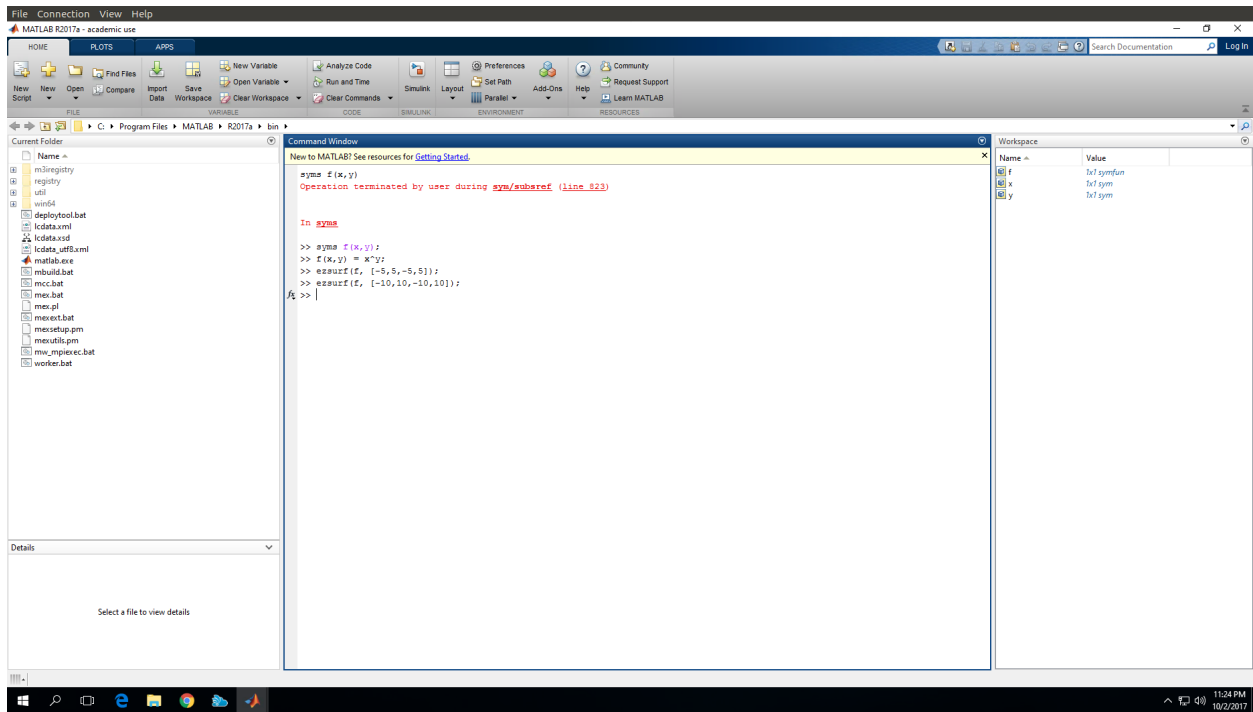
```
>> limit(f3, y, 0)
```

```
ans =
```

```
0
```

Figure 1: $f_3(0,0) = 0$ will make the function f_3 continuous at the origin. This works because the limit as you approach this point along the x axis, where the y value is held to zero, the limit approaches $z = 0$. By the same token, as you approach along the y -axis, where the x value is kept at zero, it too approaches $z = 0$. While this does not show that the limit works for all possible ways of approaching the point $(0,0)$, it is enough for us to assume $f_3(0,0) = 0$.

Exercise Three:



If it is accepted that $0^0 = 1$, then the graph of $f(x,y)$ will be $(0,0,1)$. This means that the function is not continuous. Assigning a value of $f(0,0) = 0$ to the function will make $f(x,y)$ continuous.

Exercise Four:

4) If $y=0$ then $f(x,0)$ is the function. $f(1,0)=1$ $f(\frac{1}{2},0)=1$ $f(\frac{1}{100},0)=1$
 $\lim_{(x,y) \rightarrow (0,0)} f(x,0) = 1$

If $x=0$ then $f(0,y)$ is the function. $f(0,1)=0$ $f(0,\frac{1}{2})=0$ $f(0,\frac{1}{100})=0$
 $\lim_{(x,y) \rightarrow (0,0)} f(0,y) = 0$

If $y=x$ then $f(x,y)$ is the function. $f(1,1)=1$ $f(\frac{1}{2},\frac{1}{2})=\frac{1}{\sqrt{2}}$ $f(\frac{1}{100},\frac{1}{100})=.955$
 $\lim_{(x,y) \rightarrow (0,0)} f(x,y)$ when $x=y=1$

For different curves of $y=\gamma(x)$ we get different limits therefore there is no one limit for $f(x,y)=x^y$ at $(0,0)$.

For any positive A you can find $\lim_{x \rightarrow 0} x^{\log_x A} = A$ Therefore you can find any positive limit along the surface as $x \rightarrow 0$.

$\lim_{x \rightarrow 0} x^{\log_x(1)} = 1$ $\lim_{x \rightarrow 0} x^{\log_x(2)} = 2$ $\lim_{x \rightarrow 0} x^{\log_x(3)} = 3 \dots$ They all approach different points with positive y values.

$$x = x \quad y = x^{\log_x A} = A$$

Exercise Five:

