Math 2130 Homework 1: 12.1-12.5
Complete the following exercises on separate sheets of paper. Be sure to read over the presentability guidelines (on the 2130 webpage) first.

(1) How are the $xz$ plane and $x$ axis oriented relative to each other? How are the $xz$ plane and $y$ axis oriented relative to each other?

The $x$ axis is contained in the $xz$ plane, the $y$ axis is perpendicular to the $xz$ plane.

(2) How far is the point $(1, 2, 3)$ from the $xz$ plane? From the point $(3, 2, 1)$?

$2, \sqrt{8}$

(3) Construct a table for the function $f(x, y) = x^y$ for $x = 1, 2, 3$ and $y = 1, 2, 3$.

<table>
<thead>
<tr>
<th>$x \backslash y$</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>9</td>
<td>27</td>
</tr>
</tbody>
</table>

(4) What point do these graphs have in common?
(a) $f(x, y) = 9$
(b) $g(x, y) = (x + y)^2$
(c) $h(x, y) = 3^x$

They actually have two points in common. Those points are $(2, 1, 9)$ and $(2, -5, 9)$.

(5) Write out the order that these functions occur in each row of the following table:

$A(x, y) = -x^2 - y^2$  $B(x, y) = x - y$  $C(x, y) = \sin(\pi(x^2 + y^2))$  $D(x, y) = -x^3$  $E(x, y) = -y^3$
(6) For the function $f(x,y) = x^3 - y$, describe the intersection of its graph with:

(a) The $xz$ plane

The graph $z = x^3$ in the $xz$ plane

(b) The $xy$ plane

The graph $y = x^3$ in the $xy$ plane

(c) The plane $y = 1$

The graph $z = x^3 - 1$ in the plane $y = 1$

(7) Find an equation of the plane through the points $(0, 0, 0), (0, 1, 1), (1, 2, 1)$.

$z = y - x$

(8) What shapes do the level surfaces of $f(x,y,z) = x^2 + y^2 - z^2$ look like?

Hyperboloids of two sheets, a double cone, and hyperboloids of one sheet