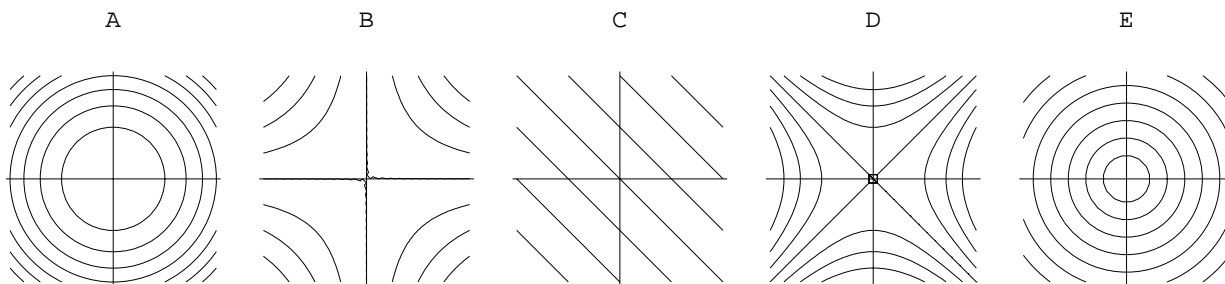


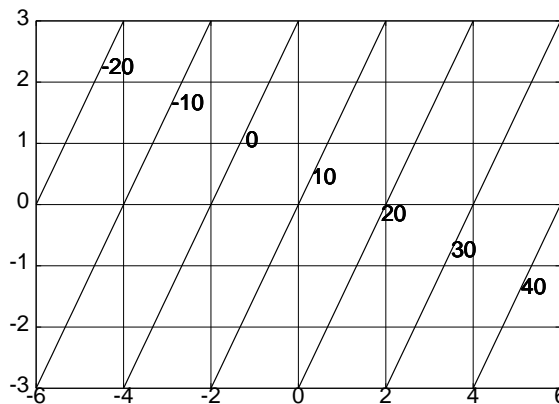
Show **ALL** work for credit; be neat; and use only **ONE** side of each page of paper. Do **NOT** write on this page. Calculators can be used for graphing and calculating only. Give exact answers when possible.

- Find the equation of the plane perpendicular to the vector $\mathbf{n} = \langle 5, 1, -2 \rangle$ and passing through the point $(0, 1, -1)$.
- Find the equation of the plane through the points $(1, 3, 0)$, $(3, 4, -3)$ and $(3, 6, 2)$.
- The following are maple contour plots of $z = xy$, $z = x^2 + y^2$, $z^2 = x^2 + y^2$, $z = x + y$, and $z = x^2 - y^2$ over the range $x = -3..3$ and $y = -3..3$. Match the plot to the function.



- Find the equation of the linear function $f(x, y) = ax + by + c$ that
 - has the partial given table of values (below left).
 - has the given contour graph (below right).

	$y=3$	$y=5$	$y=7$
$x=1$	2	?	?
$x=4$?	0	4



- Give an equation which fits the description. (There are multiple correct answers.)
 - Hyperboloid of one sheet.
 - Hyperboloid of two sheets.
 - Hyperbolic paraboloid.
 - Elliptical paraboloid.
 - Sphere with center $(1, 2, 3)$ and radius 4.
- Find the value(s) (if any) of x which would make the vectors $\langle 2, x, 3 \rangle$ and $\langle x, 8, 6 \rangle$ are perpendicular, and find the value(s) (if any) which would make vectors are parallel.
- Find the coordinates of the point where the line through the points $(2, -1, 3)$ and $(4, -2, 1)$ intersects the plane $x + 2y - z = 13$
- Consider the plane P given by the equation $2x + 4y - z = -8$.
 - Find a point on the x -axis on the plane P .
 - Find a vector going from the point $Q = (3, -2, 4)$ to the point you found in (a).
 - Find the scalar projection of the vector in (b) in the direction normal to P .
 - Find the distance from Q to P .

- Find the 8 errors in the following Maple command. Assume that a restart command has just been given or equivalently that this is the very first line typed into Maple. (No "with(plots);" is not one of them.)


```
▷ a:0;b=5;plot3d(x y + 3x^2,x=a..b,y=3..-3,NUMPOINTS=99,title="oops...I did it again");
```

There is more test on the otherside

10. Odds and ends: In parts (a-d): Give an equation which fits the description. (There are multiple correct answers.) Sketch the graph in part (e).

- (a) The xz -plane.
- (b) Ellipsoid with the y -axis direction twice the size of the other two.
- (c) Circular Cylinder whose axis is the z -axis.
- (d) Two planes parallel to the xy -plane. (One equation whose solution is exactly the two planes.)
- (e) Sketch the temperature cross-section along the thick horizontal line in the contour graph below. (No equation, just the graph.)

