Math 54
Review

1. Have you taken Math 53 (or a multivariable calculus course)?

2. Have you taken a linear algebra course before?

3. Graph the lines $x + y = 1$ and $2x - y = 5$ and find their point of intersection.

4. Give an example of a line orthogonal to $x + 3y = 2$.

5. In the same picture, graph the lines $x+2y = n$ for n in the set $\{-2, -1, 0, 1, 2\}$.

6. Sketch the region of the plane given by

$$x + y \geq 0$$
$$x - y \geq 0$$

7. What point on the line $x + 2y = 2$ is closest to the origin?

8. Graph the plane $x + 2y + 3z = 1$.

9. Let L be the line given by

$$x = 0$$
$$y + z = 2$$

Let P be the plane given by

$$x + y + z = 0$$

Find the point(s) where they intersect.

10. Sketch the region of 3-dimensional space given by

$$x \geq 0$$
$$y \geq 0$$
$$z \geq 0$$

11. Let R be the region of the previous problem. Find the point on R closest to the point $(1, -1, 3)$. Find the point on R closest to the point $(-1, -2, -1)$. Which one is closer to R?

12. Multiply the matrices

$$\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$$

13. What sort of shape does

$$f(t) = (t, 1 - t, 0)$$

describe?

14. Let $1 + i$ and $1 + 2i$ be complex numbers. What is their product?

15. Plot $e^{\pi i/3}$ in the complex plane.

16. Let $0 \leq \theta < 2\pi$. How does multiplication by $e^{i\theta}$ transform the complex plane?

17. Sketch a graph of the functions

$$f(x) = \frac{\sin(x)}{x},\ g(x) = xe^{-x}$$

18. Solve the following differential equation for u:

$$u' = u$$

19. Solve the following differential equation for u:

$$u'' = u$$

20. Solve the following differential equation for u:

$$u'' - 3u' + 2u = \cos(\pi t)$$

(here u is a function of t).