# Math 121 – Quiz 3 Solution

1. Consider the rational function:
$$R(x) = \frac{x^2 + 5x + 6}{x + 3}$$

    (a) What is the domain of $R(x)$?

    (b) Find all $x$-intercepts.

    (c) Find all vertical asymptotes, if any.

    (d) Find the horizontal or oblique asymptote, if there is one.

2. Solve the inequality $x^3 + 8x^2 < 0$.

**Solution**:

1.  (a) the domain is all $x$ except $x = -3$

    (b) the $x$-intercept is at $x = -2$

    (c) there are no vertical asymptotes (there is a hole at $x = -3$)

    (d) simplifying $R(x)$ we have:

$$R(x) = \frac{(x + 2)(x + 3)}{x + 3} = x + 2$$

   so $y = x + 2$ is an oblique asymptote

2. Solving the inequality, we have:

$$f(x) = x^3 + 8x^2 < 0$$
$$f(x) = x^2(x + 8) < 0$$

Using the fact that the zeros of $f(x)$ are $x = 0, -8$, we set up the following table:

| Interval | $(-\infty, -8)$ | $(-8, 0)$ | $(0, \infty)$ |
|---|---|---|---|
| **Number Chosen** | $-9$ | $-1$ | $1$ |
| **Value of** $f$ | $f(-9) = -81$ | $f(-1) = 7$ | $f(1) = 9$ |
| **Location of graph** | below $x$-axis | above $x$-axis | above $x$-axis |

Since $f(x) < 0$, the solution is $x < -8$.