3. [10 points] Suppose:

- $f(x)$ is a function with domain $(-2, 5]$.
- $g(x) = f(x + 5) + 4$.
- $h(x) = 3 + 2^x$.
- $j(x) = -7 + 0.6^x$.

You do not need to show any work for this problem, but you may receive partial credit for correct work shown. Please be sure to **circle** your answers in all parts of this problem.

a. [3 points]
What is the domain of $g(x)$? Give your answer using **inequalities**.

Solution: The graph of $g(x)$ is the graph of $f(x)$ shifted 5 units to the left, so the domain of $g(x)$ can be obtained by shifting the domain of $f(x)$ accordingly, giving us

$$-7 < x \leq 0$$

b. [3 points]
The **point** $(4, -7)$ lies on the graph of $f(x)$. What point MUST lie on the graph of $g(x)$?

Solution: Since the graph of $g(x)$ is a shift of the graph of $f(x)$ by 5 units left and 4 units up, the related point on $g(x)$ is the point $(4, -7)$ shifted the same way, giving us

$$(-1, -3)$$

c. [2 points]
The horizontal asymptote of $y = h(x)$ is:

Solution: The horizontal asymptote of 2^x is $y = 0$, and since the graph of $h(x)$ is the graph of 2^x shifted up by 3, $h(x)$ has horizontal asymptote

$$y = 3$$

d. [2 points]
$\lim_{x\to\infty} (j(x)) =$

Solution: We know $\lim_{x\to\infty} 0.6^x = 0$, and since the graph of $j(x)$ is the graph of 0.6^x shifted down by -7, we get that

$$\lim_{x\to\infty} j(x) = -7$$