More Sequence Problems

Determine if the following sequences converge or diverge, is monotone and is bounded. If the sequences converges determine what it converges to.

1. \((-1)^n + 3\) \(n \geq 0\)
2. \(\left(\frac{47 + 9n^2}{5n^2 - 3n}\right)_{n \geq 0}\)
3. \(\left(\frac{3^n}{k+1}\right)_{k \geq 2}\)
4. \(\left(\frac{3m^3 - 8m}{(2m+1)^2}\right)_{m \geq 0}\)
5. \((e^{-3n})_{n \geq 0}\)
6. \(\left(\frac{\ln(n^2)}{n^2}\right)_{n \geq 1}\)
7. \(\left(\frac{(-1)^nn}{n^2 + 1}\right)_{n \geq 0}\)
8. \((\sin(k))_{k \geq 0}\)
9. \((\sin(\pi n))_{n \geq 0}\)
10. \((\cos(\pi n))_{n \geq 0}\)
11. \((\sin((4n + 1)\pi))_{n \geq -1}\)
12. \(\left(\frac{3 \cdot 4^n - 3^{2n}}{8^n + 3^n}\right)_{n \geq 0}\)
13. \(\left(\frac{(n+1)!}{(n-1)!}\right)_{n \geq 1}\)
14. \(\left(\frac{1 \cdot 3 \cdot 5 \cdots (2n+1)}{n!}\right)_{n \geq 0}\)
15. \(\left(\frac{1}{n^2} + \frac{2}{n^2} + \frac{3}{n^2} + \cdots + \frac{n}{n^2}\right)_{n \geq 1}\)
16. \(a_{n+1} = 1 - 2a_n\) and \(a_0 = 0\)
17. \(a_{n+1} = \frac{a_n - 4}{5}\) and \(a_0 = 1\)
18. \(a_{n+1} = \frac{1 - 2a_n}{4}\) and \(a_0 = 2\)
19. \(a_{n+1} = \frac{1 - 5a_n}{2}\) and \(a_0 = 7\)
20. \(a_{n+1} = 1 + 2a_n\) and \(a_0 = -1\)
21. \(a_{n+1} = \frac{a_n}{2} + \frac{2}{a_n}\) and \(a_0 = 1\)
22. \(a_{n+1} = \frac{2a_n}{3} + \frac{1}{3a_n^2}\) and \(a_0 = 2\)
23. \(a_{n+1} = 2a_n - \frac{1}{2}a_n^2\) and \(a_0 = 1\)
24. \(\left(1, \sqrt{5}, \sqrt{5\sqrt{5}}, \sqrt{5\sqrt{5\sqrt{5}}}, \ldots\right)\)

Write a sequence modeling the following.

1. The zombie apocalypse begins with 1 zombie and every zombie that lives (well, not lives, but you know, keeps moving) each month makes 5 new zombies.
2. Bob climbed up a mountain. Her initial altitude was 40 meters above sea level, and it increased by 10 meters each hour.
3. Every spring each female robin lays 3 eggs. Assume the robin population has equally many females as males.
Recall that for a fixed point $L$ if $|f'(L)| = 1$ then we don’t know if the fixed point is stable or unstable. Consider the following $a_{n+1} = f(a_n)$. Draw $y = f(x)$ and $y = x$ and using cobwebbing determine if the fixed point is stable or unstable. You can use the graphing applications [Desmos.com](https://www.desmos.com) or [this cobwebbing website](#).

Note that cobwebbing is our only method (in our course) to determine stability when $|f'(L)| = 1$, but you can certainly think about concavity and its effect on the slope near $L$.

1. $a_{n+1} = a_n^2 - 3a_n + 3$
2. $a_{n+1} = -a_n^2 + a_n + 1$
3. $a_{n+1} = a_n^2 - a_n + 1$
4. $a_{n+1} = -a_n^2 + 3a_n - 1$
5. $a_{n+1} = a_n^3 - 3a_n^2 + 4a_n - 1$
6. $a_{n+1} = -a_n^3 + 3a_n^2 - 2a_n + 1$
7. $a_{n+1} = a_n^3 - 3a_n^2 + 2a_n + 1$
8. $a_{n+1} = -a_n^3 + 3a_n^2 - 4a_n + 3$