Exercises on Basic Rational Functions

Describe a basic graph (of the form $y = \dfrac{1}{x^n}$) and a sequence of transformations that may be used to obtain the graph of the given function f. Then sketch the graph of f. Be sure to

- Sketch and label all asymptotes (with the equation of the line).

- Plot and label all x- and y-intercepts (with the ordered pair).

- Plot and label any two additional points (with the ordered pair).

Finally, use arrow notation *("As $x \to \cdots$, $f(x) \to \cdots$.")* to describe the function's end-behavior and its behavior on each side of the vertical asymptote(s).

1. $f(x) = \dfrac{1}{x} - 2$

2. $f(x) = \dfrac{1}{x-2}$

3. $f(x) = \dfrac{1}{x^2} + 1$

4. $f(x) = \dfrac{1}{(x+1)^3}$

5. $f(x) = \dfrac{1}{x^4} - 6$

6. $f(x) = \dfrac{1}{x+2.5}$

7. $f(x) = \dfrac{1}{x^5} + \sqrt{3}$

8. $f(x) = \dfrac{1}{(x-\pi)^2}$

9. $f(x) = -\dfrac{1}{x}$

10. $f(x) = -\dfrac{1}{x^4}$

11. $f(x) = \dfrac{1}{(-x)^2}$

12. $f(x) = 3 - \dfrac{1}{x^3}$

13. $f(x) = \dfrac{1}{(x+4)^5} + 2$

14. $f(x) = \dfrac{1}{(x-3)^2} - \dfrac{1}{2}$

15. $f(x) = \dfrac{5}{x^3}$

16. $f(x) = \dfrac{1/2}{x^2}$

17. $f(x) = \dfrac{1}{2x^2}$

18. $f(x) = \dfrac{1}{(2x)^2}$

19. $f(x) = \dfrac{1}{4x^2}$

20. Explain the similarities and differences in the graphs of the previous four functions.

21. $f(x) = \dfrac{3}{x} - 4$

22. $f(x) = 10 - \dfrac{2}{x^2}$

23. $f(x) = \dfrac{3}{(x+1)^4}$

24. $f(x) = \dfrac{1}{3(x-2)^3}$

25. $f(x) = \dfrac{1}{2(x+5)^2} - 7$

26. $f(x) = 2 - \dfrac{4}{(x-1)^3}$