Graphing polynomials

For each of the following graphing problems also determine

(a) where $f(x)$ is defined,

(b) where $f(x)$ is continuous,

(c) where $f(x)$ is differentiable,

(d) where $f(x)$ is increasing and where it is decreasing,

(e) where $f(x)$ is concave up and where it is concave down,

(f) what the critical points of $f(x)$ are,

(g) where the points of inflection are, and

(h) what the asymptotes to $f(x)$ are (if $f(x)$ has asymptotes).

1. Graph $f(x) = a$, where a is a constant.

2. Graph $f(x) = ax + b$,

   where a and b are constants.

3. Graph $f(x) = a(x - c) + b$,

   where a, b and c are constants.

4. Graph $f(x) = \begin{cases} 2 - x, & \text{if } x \geq 1, \\ x, & \text{if } 0 \leq x \leq 1. \end{cases}$

5. Graph $f(x) = \begin{cases} 2 + x, & \text{if } x \geq 0, \\ 2 - x, & \text{if } x < 0. \end{cases}$

6. Graph $f(x) = \begin{cases} 1 - x, & \text{if } x < 1, \\ x^2 - 1, & \text{if } x \geq 1. \end{cases}$

7. Graph $f(x) = 2x - x^2$.

8. Graph $f(x) = x - x^2 - 27$.

9. Graph $f(x) = 3x^2 - 2x - 1$.

10. Graph $f(x) = x^3$.

11. Graph $f(x) = x^3 - x + 1$.

12. Graph $f(x) = x^3 - x - 1$.

13. Graph $f(x) = (x - 2)^2(x - 1)$.

14. Graph $f(x) = 2x^3 - 21x^2 + 36x - 20$.

15. Graph $f(x) = 2x^3 + x^2 - 20x$.

16. Graph $f(x) = 1 - x^4$.

17. Graph $f(x) = x^4 - 3x^2 + x$.

18. Graph $f(x) = 3x^4 - 4x^3 - 12x^2 + 5$.

19. Graph $f(x) = 3x^4 - 16x^3 + 18x^2$.

20. Graph $f(x) = 3x^5 - 25x^3 + 60x$.

21. Graph $f(x) = x^5 - 4x^4 + 4x^3$.

22. Graph $f(x) = x^3(x-2)^2$.

23. Graph $f(x) = (x-2)^4(x+1)^3(x-1)$.

24. Graph $f(x) = (x-3)^5(x+1)^4$.