1. Given $f(x) = x^2 + 7x + 6$ find $\dfrac{f(a+h) - f(a)}{h}$
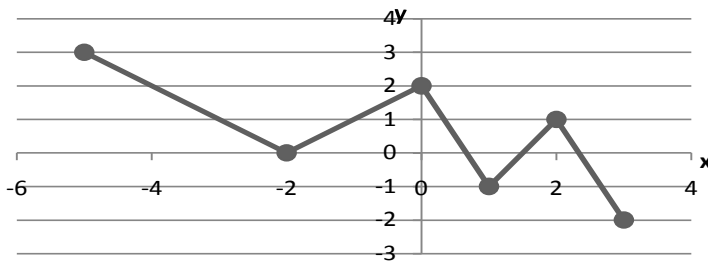
2. Find the domain of the function $\dfrac{2x + 7}{x^3 - 16x}$

3. Graph $f(x) = \begin{cases} x^2 + 2 & x \le -2 \\ 3x + 2 & x > -2 \end{cases}$

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

5. Determine whether the equation defines y as a function of x: $x^2 + y^2 = 4$

6. The graph of a function is given below. Determine the intervals of which the function
    a)increases and b) decreases

7. Determine the average rate of change $\dfrac{f(b) - f(a)}{b - a}$ of the function between the given

   values of the variable $f(x) = x^2 - 4x$; $x = 1$ and $x = 3$

8. Graph $f(x) = |x| - 3$

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

10. Let $f(x) = x^2 + 3x + 5$ and $g(x) = x^3 + 7x^2 + 9$ find $(f - g)(x)$

11. Let $f(x) = \dfrac{x}{3x+5}$ and $g(x) = 2x - 3$ find $(g \circ f)(x)$

12. Express the function $h(x)$ as a composite of two functions $f(x)$ and $g(x)$ so $h(x) = (f \circ g)(x)$)
$$h(x) = \sqrt[3]{x^2 + 5x + 7}$$

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

14. Explain whether the graph of $f(x) = |x| - 3$ (problem 8 above) is one-to-one.

15. Explain whether the quadratic has a maximum or minimum and then find that value if
$$f(x) = 2x^2 + 7x - 15$$

16. Express $f(x) = 2x^2 + 7x - 15$ in the form $a(x - h)^2 + k$

4pts   17. A manufacturer finds that the revenue generate by selling x units of a certain commodity is
given by the function $R(x) = 120x - 10x^2$ where R(x) is measured in dollars. What is the
maximum revenue and how many units should be manufactured to obtain this maximum?

4pts   18. $P(x) = x^3 - 4x$ Factor the polynomial and use the factored form to find the zeroes. Sketch
the graph using x intercepts, what the graph looks like near each x intercept and end behavior to
do the sketch

4pts   19. Use long division to find the quotient and remainder $\dfrac{x^3 - x^2 - 2x + 6}{x - 2}$

4pts   20. Find a polynomial of degree four with zeroes -2, -1, 2, and 4.

4pts 21. If $P(x) = x^4 + 6x^3 + 7x^2 - 6x - 8$ determine all possible rational zeroes and then completely factor
the Polynomial.

4pts   22. Perform the indicated operation below and write the result in the form a + bi

$(3+5i)(4-2i)$

4pts 23. Find all solutions and express in the form a + bi $4x^2 - 24x + 37 = 0$

4pts 24. Factor $x^3 - 3x^2 + x - 3$ completely

4pts 25. Find a polynomial with integer coefficients that has degree 5 and a zero at 0, and zeroes at $\pm 2i$ both with a multiplicity of 2.

4pts. 26. Find all vertical and horizontal asymptotes for $y = \dfrac{x^2 - 1}{x^2 - 5x + 6}$

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4pts 27. Graph $f(x) = \dfrac{x^2}{x^2 - 4}$

Some formulas you may need

1. $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ 2. $a^3 \pm b^3 = (a \pm b)(a^2 \mp ab + b^2)$