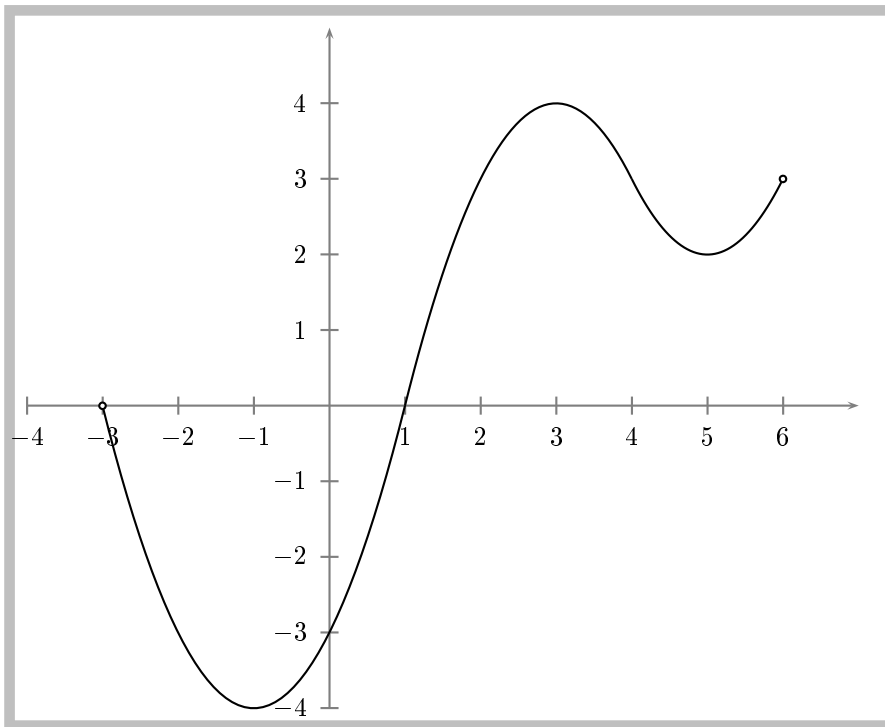1. Answer the following using the graph below.

    (a) What is $f(0)$?

    (b) For what numbers x is $f(x) = 0$?

    (c) What is the domain of $f(x)$?

    (d) What is the range of $f(x)$?

    (e) On what intervals is $f(x)$ increasing?

2. Let $f(x) = 1 - 3x$ and $g(x) = 2x + 4$. Find and completely simplify $(g \circ f)(x)$.
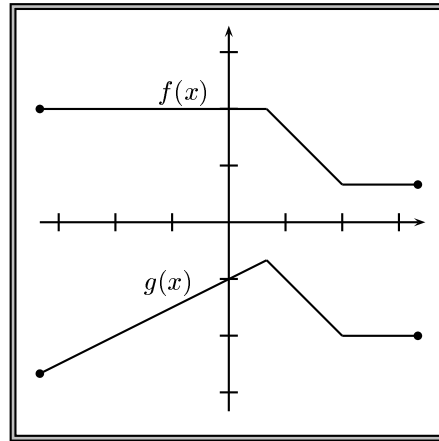
3. (10 pts) Use the table below to evaluate $f(g(1))$ and $g(f(1))$

x	1	2	3	4	5	6
$f(x)$	4	2	5	2	1	3
$g(x)$	3	6	2	3	2	1

4. Sketch the graph of a function f that satisfies all of the given conditions.

- $\lim_{x \to 0^-} F(x) = -1$
- $\lim_{x \to 0^+} F(x) = 2$
- $\lim_{x \to 2^-} F(x) = 0$
- $\lim_{x \to 2^+} F(x) = 1$
- $F(2) = 3$

5. Use the graph below to evaluate $f(g(0))$

6. If f and g are continuous functions with $f(2) = 1$ and $\lim\limits_{x \to 2}[f(x) - 2g(x)] = 9$, find $g(2)$.

7. Evaluate the $\displaystyle\lim_{x \to 5} \frac{\frac{1}{x} - \frac{1}{5}}{x - 5}$

8. Find the value of c that makes the function below continuous on $(-\infty, \infty)$:

$$f(x) = \begin{cases} 2x + c & \text{if } x \leq 1 \\ 2c - x & \text{if } x > 1 \end{cases}$$

9. The height of a rock in meters after t seconds is given by $H(t) = 100t - 10t^2$. What is the velocity after 3 seconds?

10. Use the definition to find the derivative of $f(x) = 3x - x^2$

11. Find the equation of the tangent line to the curve $y = x + x^3$ at the point $(2, 10)$

12. Use the rules to find the derivative of each of the following functions. Do NOT simplify.

    - $y = 3x^4 + 5x^2 + \pi^3$
    - $g(t) = \left(t^3 + t^2 - t\right)\left(3t + 4 + \dfrac{1}{\sqrt{t}}\right)$
    - $f(x) = x^2 - \dfrac{3}{x^2}$
    - $y = \dfrac{x^2 + 1}{x^2 - 1}$

13. Find the domain of the function $f(x) = \dfrac{(x - 1)(x - 2)}{(x + 3)(x + 5)}$

14. Let $F(x) = x^3 + x + 1$. Show that there exists a number c such that $F(c) = 4$. Give reasons.

15. Find the points on the curve $y = x^3 - x^2 - x + 1$ where the tangent line is horizontal.

16. At what points on the curve $y = x^3 - 3x$ is the tangent line parallel to the line $9x - y = 10$?

17. **(Squeeze Theorem in reverse)** Given $2x \leq G(x) \leq x^2 + 1$ for all x. For what value of a can you determine

$$\lim_{x \to a} G(x)$$