

1. Solve each of the following inequalities.

a) $(x + 2)x(x - 3) \leq 0$ b) $\frac{x + 2}{x(x + 3)} \leq 0$

2. Suppose that $\log_2 6 = a$ and $\log_8 5 = b$. Express $\log_{10} 144$ in terms of a and b .

3. If $\ln a = 0.6$ and $\ln b = 0.9$, find the exact value of $\log_{ab}(e^{5.4})$.

4. Solve each of the following equations.

a) $\log_2(x - 3)(x + 1) = 5$ b) $\log_2(x - 3) + \log_2(x + 1) = 5$

5. Find each of the following limits.

a) $\lim_{x \rightarrow \infty} \frac{\sqrt{x}}{\sqrt{x+1} - \sqrt{2x}}$ d) $\lim_{x \rightarrow 6^-} \frac{\frac{1}{x} - \frac{1}{6}}{x - 6}$ g) $\lim_{x \rightarrow -3^-} \frac{x^2 - 9}{x^2 - 2x - 15}$
b) $\lim_{x \rightarrow -\infty} \frac{\sqrt{x}}{\sqrt{x+1} - \sqrt{2x}}$ e) $\lim_{x \rightarrow 6^+} \log_6(x - 6)$ h) $\lim_{x \rightarrow 5^-} \frac{x^2 - 9}{x^2 - 2x - 15}$
c) $\lim_{x \rightarrow \infty} \frac{\sin x}{x}$ f) $\lim_{x \rightarrow 0} \frac{(\sqrt{x+25} - 5)^2}{x^2}$

6. Differentiate each of the following.

a) $f(x) = -4x^3 + x^2 - 6x + 21$ c) $f(x) = x^5 - x^2 - \frac{1}{x^2} + \frac{1}{x^5}$ e) $f(x) = \sqrt[3]{x^5} - x + \frac{1}{e^3}$
b) $f(x) = x^{10} \cos x$ d) $f(x) = \sqrt{7x}(5 \sin x - 1)$

7. Evaluate each of the following indefinite integrals.

a) $\int 6x^2 + 6x - 1 \, dx$ c) $\int x^2 + \frac{1}{x^2} \, dx$ e) $\int x^2 - 2xy + 1 \, dy$
b) $\int \sin x + \cos x \, dx$ d) $\int x^2 - 2xy + 1 \, dx$

8. Find an equation of the tangent line drawn to the graph of $y = 2x^3 - 7x + 2$ at $x = -1$.

9. Consider the function $f(x) = (x + 10)(x^2 - 19x + 70)$.

- a) Find all x -intercepts of f . c) Find all absolute maxima and minima of f .
b) Find all relative maxima and minima of f . d) Sketch the graph of f .

10. Suppose that f is a function with first derivative

$$f'(x) = -(x + 4)(x + 2)^2(x - 1)(x - 3)$$

- a) Plot a graph of f' .
b) Find all values of x for which f has a relative maximum at x .
c) Find all values of x for which f has a relative minimum at x .

11. Find the inverse for each of the following functions.

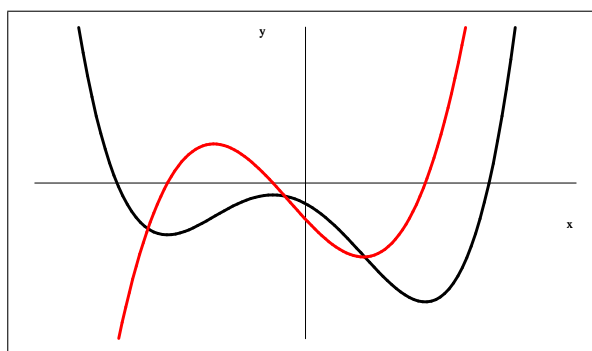
a) $f(x) = 2x - 7$ b) $f(x) = \sqrt{3x + 1}$ c) $f(x) = \frac{2x - 3}{5x + 1}$

12. Prove that the inverse of a linear function is also linear and the two slopes are reciprocals of each other.

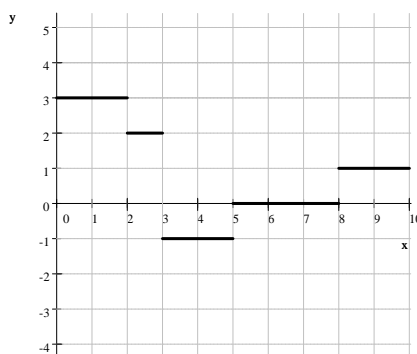
13. Sketch the graph and give a complete analysis for $f(x) = \sqrt{x+1} - 2$.
14. A company is introducing a new product. The marketing manager determines that t weeks after an advertising campaign begins, $P(t)$ percent of the potential market is aware of the burners, where

$$P(t) = 75 \frac{t^2 - 4t + 15}{t^2 - 4t + 45} + 11$$

- a) What percent of the potential market knows when the campaign begins?
- b) What percent of the potential market knows about the product after 5 weeks?
- c) What happens to the percentage $P(t)$ in the long run?
15. The picture below shows a function f and its derivative, f' . Which is which?



16. An object is moving along a vertical line. The graph below shows the velocity function $L(t)$ of the object, as a function of time.
- a) Assume it starts at location 0, graph the location function of the object.
- b) Assume it starts at location -2 , graph the location function of the object.



17. Find a polynomial $P(x)$ that satisfies the following conditions: P is of degree three, $P(0) = -2$, $P'(0) = 2$, $P''(0) = 10$ and $P'''(0) = -24$.
18. Prove that each of the following functions are one-to-one.
- a) $f(x) = \frac{2x-7}{3x+1}$ b) $f(x) = 3x^5 - 20x^3 + 135x$