

1. (8 points) Let

$$f(x) = \ln(1 + \sqrt{x}), \quad g(x) = 3x^2 + \frac{2}{x+1}.$$

Find both $f(g(x))$ and $g(f(x))$. You do not need to simplify your answer.

2. (16 points) Give an equation for the line that passes through the point $(5, -1)$ and

(a) is horizontal;

(b) is vertical;

(c) is parallel to the line $8x + 7y = 11$;

(d) also passes through the point $(-2, 1)$.

3. (8 points) Evaluate each of the following expressions.

(a) 3^{-4}

(b) $16^{3/4}$

(c) $\log_7(1/49)$

(d) $\ln(\sqrt{e})$

4. (8 points) Suppose $\ln a = 2$, $\ln b = -3$, and $\ln c = 9$. Use log rules to evaluate

$$\ln \left(\frac{a^{12}}{b^4 c^3} \right) + \ln(e) - \ln(1).$$

5. (8 points) Suppose $f(x) = Ca^x$, where C and a are both constants and $a > 0$. If $f(0) = 120$ and $f(4) = 1920$, find C and a .

6. (20 points) Evaluate each of the following limits.

(a) $\lim_{x \rightarrow 5^-} \frac{x - 3}{5 - x}$

(b) $\lim_{x \rightarrow 3^+} \frac{3 - x}{x - 3}$

(c) $\lim_{t \rightarrow 4} \frac{t^2 + 2t - 24}{t^2 - 5t + 4}$

$$(d) \lim_{w \rightarrow 2} \frac{\frac{4}{2w+1} - \frac{4}{5}}{w-2}$$

$$(e) \lim_{x \rightarrow 81} \frac{x-81}{\sqrt{x}-9}$$

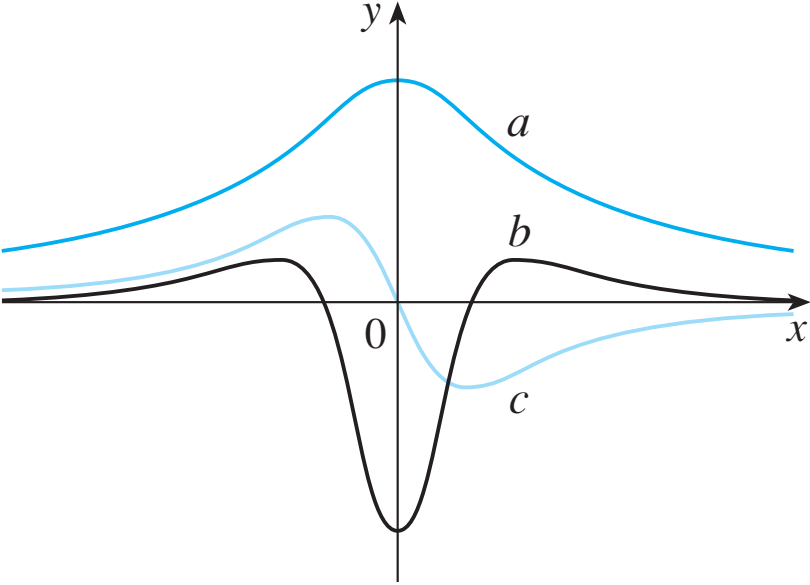
7. (8 points) Let

$$f(x) = \begin{cases} \frac{5 + \sqrt{x}}{\sqrt{5 + x}} & \text{if } 0 < x < 4 \\ cx + \frac{1}{3} & \text{if } 4 \leq x \end{cases}$$

For what value of the constant c is the function f continuous at $x = 4$?

8. (8 points) Let $f(x) = 5x^2 - 3x + 2$. Use the definition of the derivative as a limit to evaluate $f'(3)$.

9. (6 points) The figure below shows the graphs of f , f' , and f'' . The curves are labeled a , b , and c . Identify each curve.



10. (8 points) A manufacturer's weekly cost, in dollars, for producing q lamps is

$$C(q) = 810 + 3q + 0.002q^2.$$

Find the number of lamps that should be produced in order to minimize the average cost.

11. (8 points) Find the production level that will maximize profit if the cost and demand functions are the following.

$$C(q) = 16000 + 500q - 1.6q^2 + 0.004q^3.$$

$$D(q) = 1700 - 7q$$