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AP Calculus AB Review Session #1

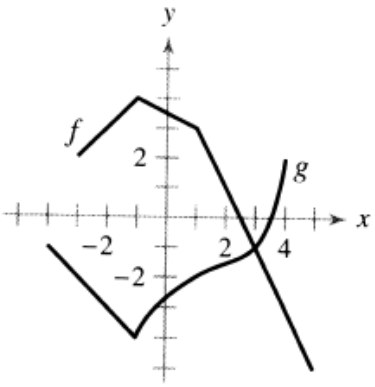
No calculators, unless otherwise specified.

1. Use the graphs of f and g to evaluate each expression. If the result is undefined, explain why.

   (a) $(f \circ g)(3)$ (b) $g(f(2))$

   (c) $g(f(5))$ (d) $(f \circ g)(-3)$

   (e) $(g \circ f)(-1)$ (f) $f(g(-1))$



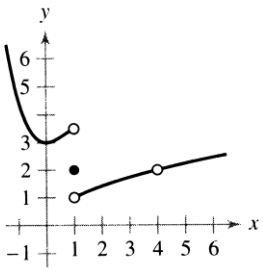
Questions 2-3: Use the graph of the function f to decide whether the value of the given quantity exists. If it does, find it. If not, explain why.

2. (a) $f(1)$

   (b) $\lim_{x \to 1} f(x)$

   (c) $f(4)$

   (d) $\lim_{x \to 4} f(x)$



3. (a) $f(-2)$

   (b) $\lim_{x \to -2} f(x)$

   (c) $f(0)$

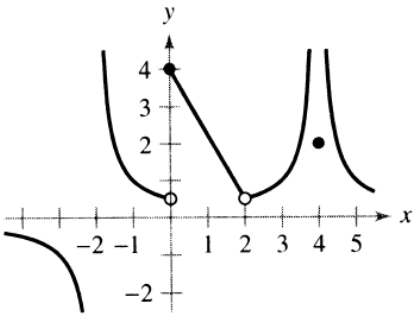
   (d) $\lim_{x \to 0} f(x)$

   (e) $f(2)$

   (f) $\lim_{x \to 2} f(x)$

   (g) $f(4)$

   (h) $\lim_{x \to 4} f(x)$

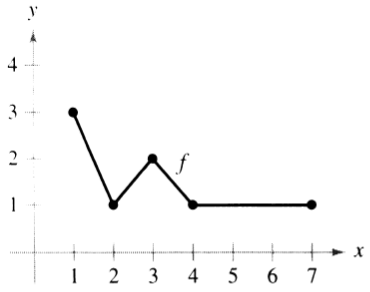


Sketch the graph of the following functions:

4. $f(x) = \begin{cases} x^2, & x \le 2 \\ 8 - 2x, & 2 < x < 4 \\ 4, & x \ge 4 \end{cases}$

5. $f(x) = \begin{cases} \sin x, & x < 0 \\ 1 - \cos x, & 0 \le x \le \pi \\ \cos x, & x > \pi \end{cases}$

6. The graph of f is shown in the figure.



   (a) Evaluate $\int_1^7 f(x)\,dx$.

   (b) Determine the average value of f on the interval $[1, 7]$.

   (c) Determine the answers to parts (a) and (b) if the graph is translated two units upward.

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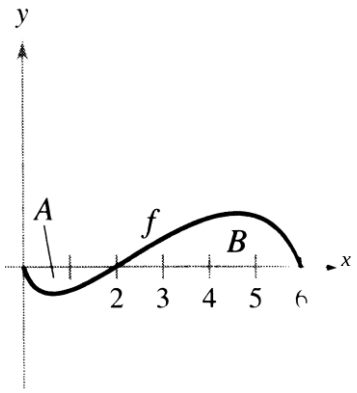
7. The graph of f is shown in the figure. The shaded region A has an area of 1.5, and $\int_0^6 f(x)\,dx = 3.5$. Use this information to fill in the blanks.



(a) $\int_0^2 f(x)\,dx =$

(b) $\int_2^6 f(x)\,dx =$

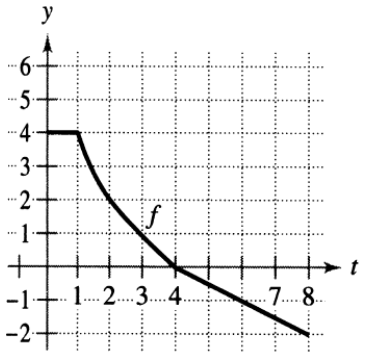
(c) $\int_0^6 |f(x)|\,dx =$

(d) $\int_0^2 -2f(x)\,dx =$

(e) $\int_0^6 [2 + f(x)]\,dx =$

(f) The average value of f over the interval $[0, 6]$ is

8. Let $g(x) = \int_0^x f(t)\,dt$, where f is the function whose graph is shown in the figure.

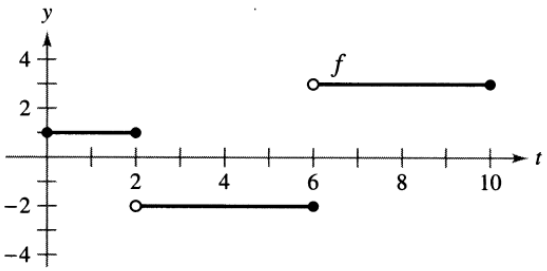


(a) Estimate $g(0)$, $g(2)$, $g(4)$, $g(6)$, and $g(8)$.

(b) Find the largest open interval on which g is increasing. Find the largest open interval on which g is decreasing.

(c) Identify any extrema of g.

9. Use the graph of the function f shown in the figure and the function g defined by $g(x) = \int_0^x f(t)\,dt$.



(a) Complete the table.

x	1	2	3	4	5	6	7	8	9	10
$g(x)$										

(b) Plot the points from the table in part (a) and graph g.

(c) Where does g have its minimum? Explain.

(d) Where does g have a maximum? Explain.

(e) On what interval does g increase at the greatest rate? Explain.

(f) Identify the zeros of g.

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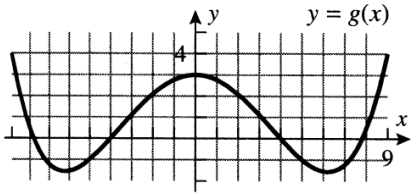
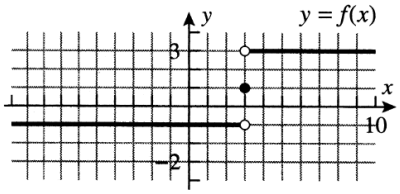
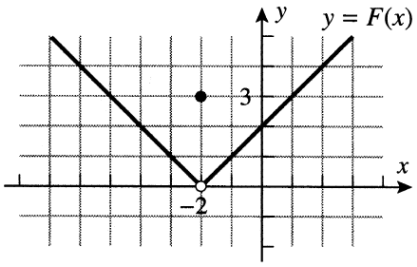
10. For the function g graphed in the accompanying figure, find
(a) $\lim_{x\to 0^-} g(x)$ (b) $\lim_{x\to 0^+} g(x)$
(c) $\lim_{x\to 0} g(x)$ (d) $g(0)$.



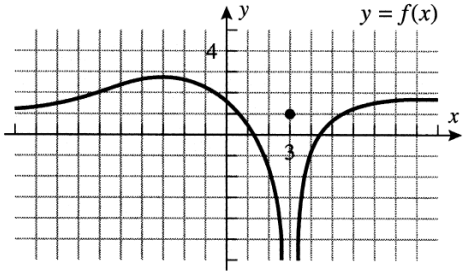
11. For the function f graphed in the accompanying figure, find
(a) $\lim_{x\to 3^-} f(x)$ (b) $\lim_{x\to 3^+} f(x)$
(c) $\lim_{x\to 3} f(x)$ (d) $f(3)$.



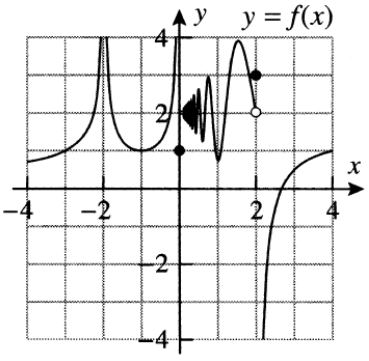
12. For the function F graphed in the accompanying figure, find
(a) $\lim_{x\to -2^-} F(x)$ (b) $\lim_{x\to -2^+} F(x)$
(c) $\lim_{x\to -2} F(x)$ (d) $F(-2)$.



13. For the function f graphed in the accompanying figure, find
(a) $\lim_{x\to 3^-} f(x)$ (b) $\lim_{x\to 3^+} f(x)$
(c) $\lim_{x\to 3} f(x)$ (d) $f(3)$.



14. For the function f graphed in the figure to the right, find:
(a) $\lim_{x\to -2} f(x)$ (b) $\lim_{x\to 0^-} f(x)$
(c) $\lim_{x\to 0^+} f(x)$ (d) $\lim_{x\to 2^-} f(x)$
(e) $\lim_{x\to 2^+} f(x)$
(f) the vertical asymptotes of the graph of f.



15. Find the following limits:

(a) $\lim_{x\to\infty} \dfrac{3x+5}{6x-8}$ (b) $\lim_{x\to-\infty} \dfrac{4x^2-x}{2x^3-5}$ (c) $\lim_{x\to\infty} \dfrac{5x^3-2x^2+1}{1-3x}$

16. Find the following limits:

(a) $\lim_{x\to 3} \dfrac{x^2-6x+9}{x-3}$ (b) $\lim_{x\to -4} \dfrac{2x+8}{x^2+x-12}$ (c) $\lim_{x\to 5} \dfrac{x^2-3x-10}{x^2-10x+25}$

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Reminder: no calculators

Questions 1-9: Evaluate each expression.

1. $\log_2 32$
2. $\log 1000$
3. $\ln e$
4. $\log_3 \frac{1}{81}$
5. $\log(.0001)$
6. $\ln 1$
7. $\log_{49} 7$
8. $\log_a a^5$
9. $\ln \frac{1}{e^4}$

10. Compute $\log_2 0$, or explain why it is undefined.

11. Solve for x: $\ln 3 + \ln 5x = \ln 60$

12. The relationship between the number of decibels, β, and the intensity of a sound, I, in watts per square centimeter is given by $\beta = 10\log_{10}\left(\frac{I}{10^{-16}}\right)$. Determine the number of decibels of a sound with an intensity of 10^{-9} watts per square centimeter.

13. Describe the end behavior of the function $h(x) = 600 - 2865x + 1867x^2 - 1234x^{33}$.

14. Divide: $\frac{x^2+4x+3}{x-5}$

15. Divide: $\frac{x^2-2x+3}{x-5}$

16. Divide: $\frac{x^2+4x+3}{x-2}$

17. Evaluate $\log_8\left(\frac{1}{\sqrt[3]{64}}\right)$

18. Evaluate $\log_9\left(\frac{1}{\sqrt[7]{81}}\right)$

26. Given the piecewise function $f(x) = \begin{cases} 3x+5 & x \le 1 \\ x^2-4 & x > 1 \end{cases}$

a) Compute $f(3) =$ b) Compute $f(1) =$ c) Compute $f(f(0)) =$

27. Given the piecewise function $f(x) = \begin{cases} 3x+5 & x \le 2 \\ x^2-4 & x > 2 \end{cases}$

a) Compute $f(-3) =$ b) Compute $f(2) =$ c) Compute $f(f(-1)) =$

28. Given the piecewise function $f(x) = \begin{cases} 3x+5 & x \le -1 \\ x^2-4 & x > -1 \end{cases}$

a) Compute $f(3) =$ b) Compute $f(-1) =$ c) Compute $f(f(1)) =$

Selected Solutions

1a) 4 b) -2 c) undef d) 3 e) 2 f) undef 2a) 2 b) DNE c) DNE d) 2
3a) DNE b) DNE c) 4 d) DNE e) DNE f) 0.5 g) 2 h) ∞
6a) 8 b) $\frac{4}{3}$ c) 20; $\frac{10}{3}$ 7a) -1.5 b) 5 c) 6.5 d) 3 e) 15.5 f) $\frac{7}{12}$
8a) $g(0) = 0, g(2) \approx 7, g(4) \approx 9, g(6) \approx 8, g(8) \approx 5$ b) increasing: $0 < x < 4$, decreasing: $4 < x < 8$
c) max at $x = 4$ 10a) 3 b) 3 c) 3 d) 3 11a) -1 b) 3 c) DNE d) 1 12a) 0 b) 0 c) 0
d) 3 13a) $-\infty$ b) $-\infty$ c) $-\infty$ d) 1 14a) ∞ b) ∞ c) 2 d) 2 e) $-\infty$
f) $x = -2$, $x = 0$, $x = 2$ 15a) $\frac{1}{2}$ b) 0 c) $-\infty$ 16a) 0 b) $-\frac{2}{7}$ c) DNE