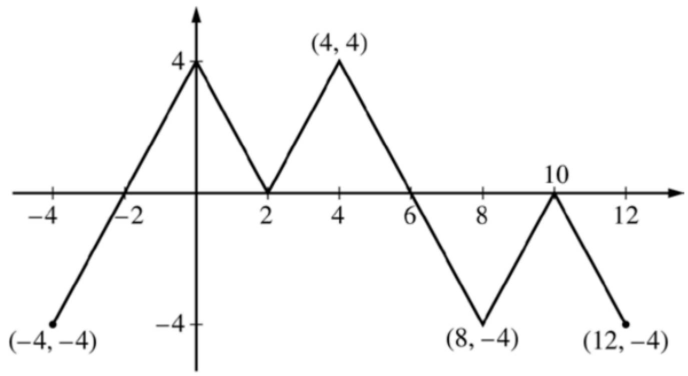
Final Practice FRQ Problems



Graph of f

1. The continuous function f is defined on the closed interval $-4 \leq x \leq 12$ and consists only of line segments as shown in the figure above. The function g is given by $g(x) = \int_{-2}^{x} f(t)\,dt$.

a. Evaluate $\int_{-1}^{2} f'(6-4x)\,dx$

b. Find $\lim_{x \to 0} \frac{\int_{-4}^{2x} f(t)dt}{3x^2+x}$

c. On the interval $-4 \leq x \leq 12$, identify the x-value(s) at which g has a relative minimum. Justify your answer.

d. Let $Q(x) = x^2 - g(x)$. Write the second degree Taylor Polynomial for Q about x=-2.

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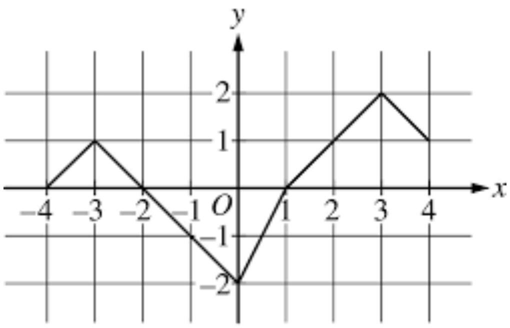


Graph of f

x	-2	-1	0	2	3
g(x)	-3	-2	1	4	5
g'(x)	6	2	-3	-2	3

2. The function f is defined and continuous on the closed interval $-4 \leq x \leq 4$ and is piecewise-linear as shown above. The function g is twice-differentiable for all values of x. Selected values of g and g', the derivative of g, are given in the table above. The function $h(x) = \frac{b}{x^{\sqrt{2}p-1}}$ is defined for $x > 0$ where b and p are both constants.

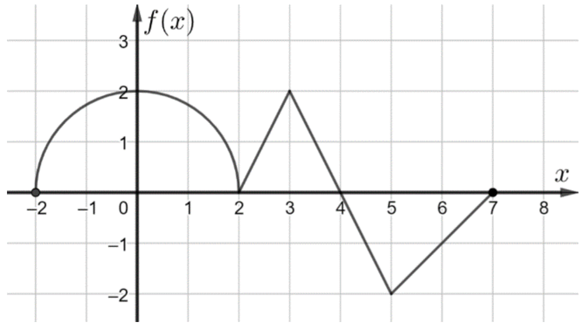
a. $\int_{-2}^{2} \frac{1}{2} x g''(x)\, dx$

b. $\int_{-1}^{1} f'(1-2x)\, dx$

c. $k(x) = \int_{1}^{\cos(x)} 2g(x)dx$. What is the value of $k'(\frac{\pi}{2})$?

d. Let $a_n = h(n)$. For what values of p does $\sum_{n=1}^{\infty} a_n$ converge?

5 for 5: Calculus AB Day 1



The function f is continuous on the interval $[-2, 7]$ and consists of three line segments and a semi circle as shown in the figure above. The function g is defined by $g(x) = \int_{-2}^{x^2} f(t)dt$.

AB1: Find $g(2), g'(2)$, and $g''(2)$.

AB2: Let $h(x) = f(5x - 9)$. Find $h'(3)$.

AB3: Evaluate $\int_{-1}^{0} [f'(3 - 2x) - 4]\, dx$.

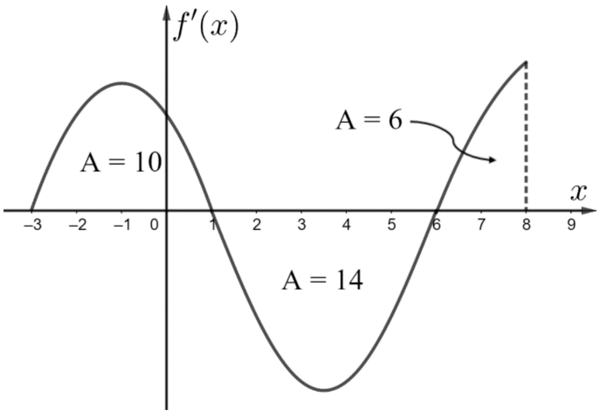
t seconds	0	1	4	6
$P(t)$ people per second	8	3	5	10

For $0 \le t \le 6$ seconds, people enter a school at the rate $P(t)$, measured in people per second.

AB4: Approximate $P'(5)$. Using correct units, interpret the meaning of $P'(5)$ in the context of the problem.

AB5: Use a left Riemann sum with the three subintervals indicated by the table above to approximate $\int_{0}^{6} P(t)dt$.

5 for 5: Calculus AB Day 2



x	1	4	6	9
$g(x)$	3	1	0	−1
$g'(x)$	2	0	1	3

A portion of the graph of f', the derivative of the twice differentiable function f, is shown in the figure above. The areas of the regions bounded by the graph of $f'$and the x axis are labeled. It is known that $f(1) = -2$.

The function g is twice differentiable. Selected values of g and g' are shown in the table above.

AB1: Find all values of x in the open interval $-3 < x < 8$ for which the graph of f has horizontal tangent line. For each value of x, determine whether f has a relateive minimum, relative maximum, or neither a minimum nor a maximum at the x value. Justify your answers.

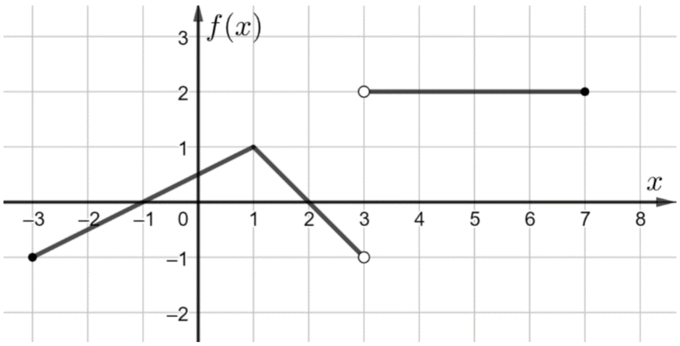
AB2: Find the minimum value of f on the closed interval $[-3, 8]$. Justify your answer..

AB3: Let $h(x) = \frac{e^{g(x)}}{3x}$. Find $h'(6)$.

AB4: Is there a time $c, 1 < c < 9$, such that $g'(c) = -\frac{1}{2}$? Give a reason for your answer.

AB5: Evaluate $\int_1^4 [g(x)]^2 g'(x)dx$.

5 for 5: Calculus AB Day 3



x	0	1	3	5
$g(x)$	2	0	5	-1
$g'(x)$	7	4	-2	3

The function f is defined and continuous for all $x \geq -3$ except at $x = 3$. A portion of the graph of f, consisting of three linear pieces is shown in the figure above.

The function g is differentiable for all values of x. Selected values of g and g', the derivative of g, are given in the table above.

AB1: Write an equation of the line tangent to g at $x = 3$. Use this tangent line to approximate $g(2)$.

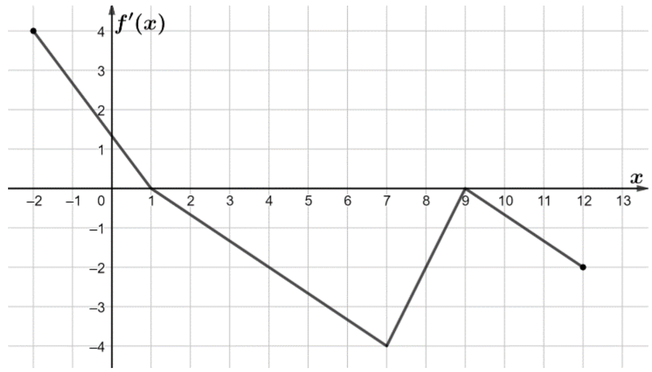
AB2: Evaluate $\lim\limits_{x \to -1} \dfrac{\int_{-3}^{x^2} f(t)dt}{x^3 + 1}$

AB3: Let $k(x) = g\big(f(x)\big)$. Find $k'(2)$.

AB4: Let $p(x) = \begin{cases} f(x)g'(x) & x < 3 \\ 4f'(x-3) & x \geq 3 \end{cases}$. *Is* $p(x)$ continuous at $x = 3$? Why or why not?

AB5: If $\displaystyle\int_{-3}^{10} f(x)dx = 5$, find the value of $\displaystyle\int_{7}^{10} f(x)dx$. Show the work that leads to your answer.

5 for 5: Calculus AB Day 4



The function f is differentiable on the interval $[-2, 12]$ and consists of three line segments as shown in the figure above. It is known that $f(4) = 14$

AB1: On what open intervals is the graph of f both decreasing and concave down? Give a reason for your answer.

AB2: Let $g(x) = f(x)f'(x)$. Find $g'(4)$.

AB3: Evaluate $\int_{-2}^{12} [3 - 2f'(x)]\, dx$.

t	0	0.2	0.4	0.5	0.6	0.8	1.0
$W(t)$	4	5.7	9.3	12.2	16.3	29.3	53.2

Consider the differential equation $\frac{dW}{dt} = 9 - W^2$. Let $y = W(t)$ be the particular solution to the differential equation with the initial condition $W(0) = 4$. The function W is twice differentiable with selected values of W given in the table above.

AB4: Find $\frac{d^2W}{dt^2}$ in terms of W.

AB5: Use a midpoint Riemann sum with the three subintervals indicated by the table above to approximate $\int_0^1 W(t)dt$.