AP Calculus
QR Code Review

Name: Key
Date: ______________ Per: ____

Create two true statements from the problems below:

<table>
<tr><th>Problem</th><th>QR code</th><th>Word</th></tr>
<tr><td>Let f be the function given by $f(x) = 300x - x^3$. On which of the following intervals is the function f increasing?
(A) $(-\infty, -10]$ and $[10, \infty)$
(B) $[-10, 10]$
(C) $[0, 10]$ only
(D) $[0, 10\sqrt{3}]$ only
(E) $[0, \infty)$
$300 - 3x^2 = 0$
$100 = x^2$
$x = \pm 10$
f is dec inc dec
f' − + −
−10 10</td><td></td><td></td></tr>
<tr><td>If $f(x) = 7x - 3 + \ln x$, then $f'(1) =$
(A) 4 (B) 5 (C) 6 (D) 7 (E) 8
$f'(x) = 7 + \frac{1}{x}$
$f'(1) = 7 + 1$</td><td></td><td></td></tr>
<tr><td>$$f(x) = \begin{cases} \frac{(2x+1)\cancel{(x-2)}}{\cancel{x-2}} & \text{for } x \neq 2 \\ k & \text{for } x = 2 \end{cases}$$
$2(2)+1 = 5$
$2x+1 = k$ @$x=2$
Let f be the function defined above. For what value of k is f continuous at $x = 2$?
(A) 0 (B) 1 (C) 2 (D) 3 (E) 5</td><td></td><td></td></tr>
<tr><td>If $y = x\sin x$, then $\frac{dy}{dx} =$
$y' = \sin x + x\cos x$
x $\sin x$
1 $\cos x$
(A) $\sin x + \cos x$
(B) $\sin x + x\cos x$
(C) $\sin x - x\cos x$
(D) $x(\sin x + \cos x)$
(E) $x(\sin x - \cos x)$</td><td></td><td></td></tr>
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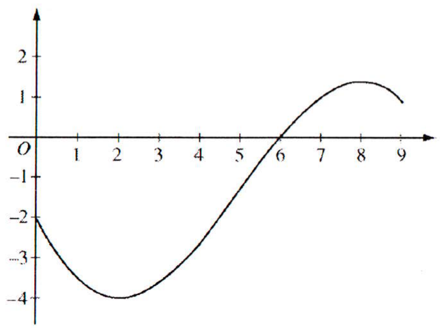


Graph of f

The graph of a differentiable function f is shown above. If $h(x) = \int_0^x f(t)\,dt$, which of the following is true?

(A) $h(6) < h'(6) < h''(6)$

(B) $h(6) < h''(6) < h'(6)$

(C) $h'(6) < h(6) < h''(6)$

(D) $h''(6) < h(6) < h'(6)$

(E) $h''(6) < h'(6) < h(6)$

$h' = f(x)$

$h'' = f'(x)$

$h(6) < 0$

$h'(6) = 0$ slope $= 0$

$h''(6) > 0$ CU

What is the area of the region in the first quadrant bounded by the graph of $y = e^{x/2}$ and the line $x = 2$?

(A) $2e - 2$ (B) $2e$ (C) $\frac{e}{2} - 1$ (D) $\frac{e-1}{2}$ (E) $e - 1$

$\int_0^2 e^{x/2}\,dx$ $u = \frac{x}{2}$

$2e^{x/2}\Big]_0^2$

$2[e^1 - 1]$

$\lim\limits_{h\to 0} \frac{\ln(4+h) - \ln(4)}{h}$ is

(A) 0 (B) $\frac{1}{4}$ (C) 1 (D) e (E) nonexistent

$f(x) = \ln x$

$f'(4) = \frac{1}{4}$

t (hours)	4	7	12	15
$R(t)$ (liters/hour)	6.5	6.2	5.9	5.6

$\int_4^{15} R(t) + 50$

$(3)(6.2) + (5)(5.9) + 3(5.6)$

A tank contains 50 liters of oil at time $t = 4$ hours. Oil is being pumped into the tank at a rate $R(t)$, where $R(t)$ is measured in liters per hour, and t is measured in hours. Selected values of $R(t)$ are given in the table above. Using a right Riemann sum with three subintervals and data from the table, what is the approximation of the number of liters of oil that are in the tank at time $t = 15$ hours?

(A) 64.9 (B) 68.2 (C) 114.9 (D) 116.6 (E) 118.2

New Sentence

If $y = \left(x^3 - \cos x\right)^5$, then $y' =$ $5(x^3 - \cos x)^4 (3x^2 + \sin x)$

(A) $5\left(x^3 - \cos x\right)^4$

(B) $5\left(3x^2 + \sin x\right)^4$

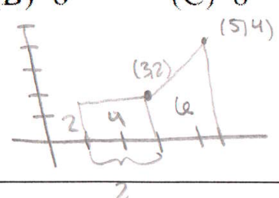
(C) $5\left(3x^2 + \sin x\right)$

(D) $5\left(3x^2 + \sin x\right)^4 \cdot (6x + \cos x)$

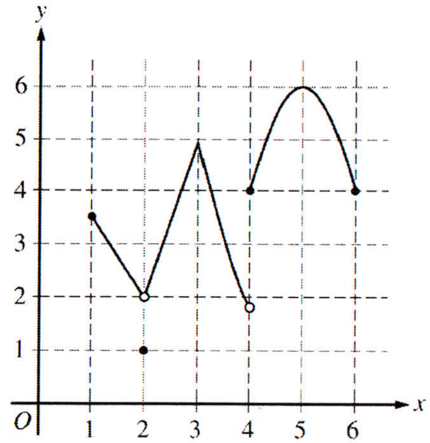
(E) $5\left(x^3 - \cos x\right)^4 \cdot \left(3x^2 + \sin x\right)$

The function f is defined by $f(x) = \begin{cases} 2 & \text{for } x < 3 \\ x - 1 & \text{for } x \geq 3. \end{cases}$ What is the value of $\int_1^5 f(x)\,dx$?

(A) 2 (B) 6 (C) 8 (D) 10 (E) 12



$\frac{1}{2}(2+4) \cdot 2$



Graph of f

The graph of the function f is shown above. Which of the following statements is false?

(A) $\lim_{x\to 2} f(x)$ exists. $=2$

(B) $\lim_{x\to 3} f(x)$ exists. $=5$

(C) $\lim_{x\to 4} f(x)$ exists. $\lim_{x\to 4^-} f(x) = 2$ $\lim_{x\to 4^+} f(x) = 4$

(D) $\lim_{x\to 5} f(x)$ exists. $=6$

(E) The function f is continuous at $x = 3$. T

The line $y = 5$ is a horizontal asymptote to the graph of which of the following functions?

(A) $y = \dfrac{\sin(5x)}{x}$ $\to \pm 1$, $\to \infty$, $\dfrac{\#}{\infty} = 0$

(B) $y = 5x$ $y = \infty$

(C) $y = \dfrac{1}{x-5}$ $y = 0$

(D) $y = \dfrac{5x}{1-x}$ $y = -5$

(E) $y = \dfrac{20x^2 - x}{1 + 4x^2}$

$\int \sec x \tan x \, dx =$

(A) $\sec x + C$

(B) $\tan x + C$

(C) $\dfrac{\sec^2 x}{2} + C$

(D) $\dfrac{\tan^2 x}{2} + C$

(E) $\dfrac{\sec^2 x \tan^2 x}{2} + C$

$\frac{1}{\cos x} \cdot \frac{\sin x}{\cos x} \, du$ $\quad u = \cos x$, $du = -\sin x \, dx$

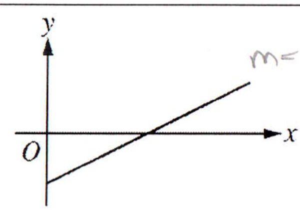
$-\int \frac{1}{u^2} \, du$

$-\left(\frac{u^{-1}}{-1}\right) + c$

$\frac{1}{\cos x} + c$

$\sec x + c$

or know $\frac{d}{dx}[\sec x] = \sec x \tan x$

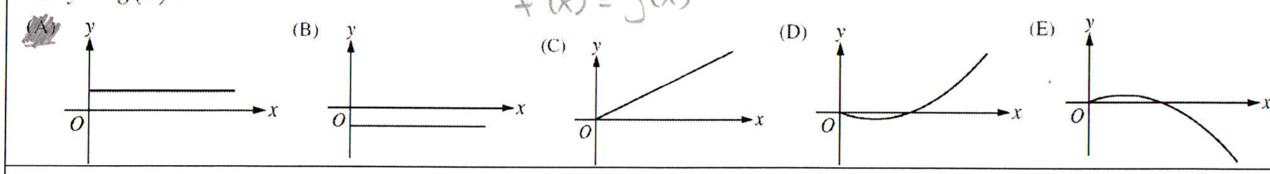


m = constant

Graph of f

The figure above shows the graph of f. If $f(x) = \int_2^x g(t)\, dt$, $= G(x) - G(2)$ which of the following could be the graph of $y = g(x)$?

$f'(x) = g(x)$



If $f(x) = \sqrt{x^2 - 4}$ and $g(x) = 3x - 2$, then the derivative of $f(g(x))$ at $x = 3$ is

(A) $\dfrac{7}{\sqrt{5}}$ (B) $\dfrac{14}{\sqrt{5}}$ (C) $\dfrac{18}{\sqrt{5}}$ (D) $\dfrac{15}{\sqrt{21}}$ (E) $\dfrac{30}{\sqrt{21}}$

$\frac{d}{dx} f(g(x)) = f'(g(x)) \cdot g'(x)$

$\frac{d}{dx} f(g(x))\Big|_{x=3} = f'(g(3)) \cdot g'(3)$

$= f'(7) \cdot g'(3)$

$= \frac{7}{3\sqrt{5}} \cdot 3$

$g(3) = 7$

$g'(x) = 3$

$f'(x) = \frac{1}{2}(x^2-4)^{-1/2} \cdot 2x$

$f'(x) = \frac{x}{\sqrt{x^2-4}} \rightarrow \frac{7}{\sqrt{45}} = \frac{7}{3\sqrt{5}}$

Let g be a function with first derivative given by $g'(x) = \int_0^x e^{-t^2}\,dt$. Which of the following must be true on the interval $0 < x < 2$?

$\frac{1}{e^{t^2}} > 0$ area under curve > 0

(A) g is increasing, and the graph of g is concave up.

(B) g is increasing, and the graph of g is concave down.

$g'(x) > 0$

(C) g is decreasing, and the graph of g is concave up.

(D) g is decreasing, and the graph of g is concave down.

(E) g is decreasing, and the graph of g has a point of inflection on $0 < x < 2$.

$g''(x) = e^{-t^2} > 0$