AP M/C 2003

Calculator

(76) $V(t) = 3 + 4.1\cos(.9t)$ → by hand, $V'(t) = -4.1\sin(.9t)\cdot(.9)$

$a(t) = v'(t)$ $\qquad V'(4) = -4.1\sin[(.9)(4)]\cdot .9$

by calc. $\qquad = 1.633$

$y1 = 3 + 4.1\cos(.9t)$ $\qquad \boxed{C}$

$\boxed{2^{nd}}$ $\boxed{Calc}$ 6: 4 $\boxed{ENTER}$

$\frac{dy}{dx} = 1.633$ $\boxed{C}$

(77) $\int_{-3}^{3} f(x)\,dx = A + B + C$

$= -2 + 2 + -2$

$= -2$

$\int_{-3}^{3} (f(x) + 1)\,dx$

$= \underbrace{\int_{-3}^{3} f(x)\,dx}_{} + \int_{-3}^{3} 1\,dx$

$= -2 + (x)\Big|_{-3}^{3}$

$= -2 + (3 - (-3))$

$= -2 + 6$

$= 4$ $\boxed{C}$

(78) $\frac{dr}{dt} = .2\ m/sec$ $\qquad C = 20\pi\ m$

$\frac{dA}{dt} = ?$ → $A = \pi r^2$

$C = 2\pi r$ $\qquad \frac{dA}{dt} = 2\pi r \frac{dr}{dt}$

$20\pi = 2\pi r$

$10_m = r$ $\qquad \frac{dA}{dt} = 2\pi(10)(.2)$

$= 4\pi\ m^2/sec$ $\boxed{C}$

(79) $\lim_{x\to 4} f(x)$ exists if $\lim_{x\to 4^-} = \lim_{x\to 4^+}$

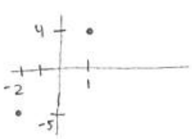
I ✓ true

II ✓ true

III × false $\left.\begin{array}{l}\lim_{x\to 4^-} = 4 \\ \lim_{x\to 4^+} = 2\end{array}\right\}\neq$

$\boxed{D}$

(80) f cont. + diff'able



a) $f(c) = 0$ true, if $f(a) < 0$ + $f(b) > 0$, $\exists$ $f(c) = 0$. on (a,b)

b) $f'(c) = 0$ might not be true.

c) $f(c) = 3$ true, if $f(a) < 3$ + $f(b) > 3$, $\exists$ $f(c) = 3$ on (a,b)

d) $f'(c) = 3$ true. if $\frac{f(a) - f(b)}{a - b} = 3$, $\exists$ $f'(c) = 3$ on (a,b) M.V.T.

(slope $\frac{-5 - 4}{-2 - 1} = \frac{-9}{-3} = 3$)

e) $f(c) \geq f(x)$ true $f(1) > f(-2)$

(81) $f'(x) = \sin(x^2+1)$

extrema → when $f'(x) = 0$

graph $f'(x)$ + look where $= 0$ on $(2,4)$

4 extrema $\boxed{D}$

(82) rate of change $r(t) = t^3 - 4t^2 + 6$ for $0 \le t \le 8$

dec → look where graph is below x-axis.

$(1.572, 3.514)$

$\boxed{A}$ $\int_{1.572}^{3.514} r(t)\,dt$

(83) avg. velocity $= \frac{1}{b-a} \int_a^b e^t + te^t \, dt$

$= \frac{1}{3} \int_0^3 (e^t + te^t)\,dt$

$= 20.086$ ft/sec $\boxed{A}$

(84) rate of Temp $= -110e^{-.4t}$, temp @ $t=5$?

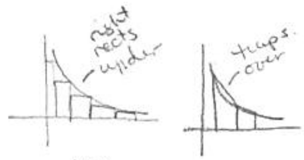
Temp $= 350 + \int_0^5 -110e^{-.4t}\,dt$

$= 350 + (-237.783)$

$= 112.2\,°F$ $\boxed{A}$

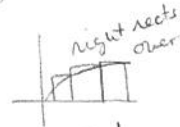
(85) trapezoid goes over. right rectangles are under.

$\boxed{A}$



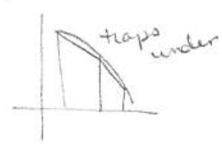
yes yes

(B)



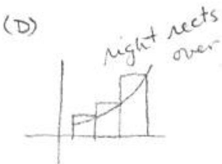
no!

(C)



no!

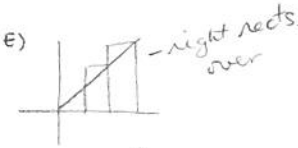
(D)



no!

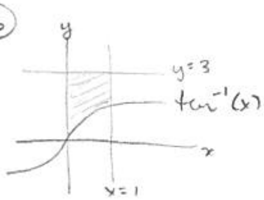
$\boxed{A}$

E)

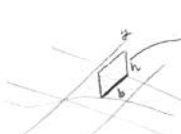


no!

(86)



→



area square $= b \cdot h$

$(3-\tan^{-1}x)(3-\tan^{-1}x)$

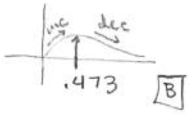
add all squares

$\int_0^1 (3-\tan^{-1}x)^2\,dx = 6.612$ $\boxed{B}$

(87) inf pt from $f''(x) = 0$

or from $f'(x)$ change from inc to dec or dec to inc.

graph $f'(x)$ & see

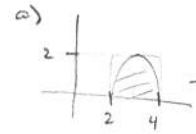


$\boxed{B}$

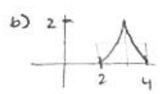
(88) $\frac{1}{4-2} \int_2^4 f(t)\,dt = 1$

$\frac{1}{2} \int_2^4 f(t)\,dt = 1$

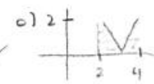
$\int_2^4 f(t)\,dt = 2$

a) 

$\rightarrow$ area $\approx$ 3 ish

b) 

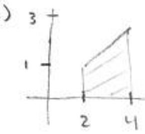
$\rightarrow$ area a little less than 2 ish

c) 

area $= \frac{1}{2}bh$

$= \frac{1}{2}(2)(2) = 2$

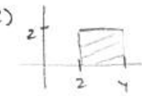
$\boxed{C}$

d) 

area $= \frac{1}{2}(b_1 + b_2)h$

$= \frac{1}{2}(1+3)(2)$

$= 4$

e) 

area $= bh$

$= 2 \cdot 2$

$= 4$

(89) $f(2) = 3$ $\quad f'(2) = -5$

$g(x) = x\,f(x)$ $\rightarrow$ tangent line, so need pt & slope

$g(x) = x\,f(x)$

$g(2) = 2\,f(2)$

$g(2) = 2(3)$

$= 6$

pt. $(2, 6)$

$g'(x) = x\,f'(x) + f(x)(1)$

$g'(2) = 2\,f'(2) + f(2)$

$= 2(-5) + 3$

$= -7$ $\rightarrow$ slope

$y - y_1 = m(x - x_1)$

$y - 6 = -7(x - 2)$

$\boxed{D}$

(90) $f'(x) > 0$ f increasing

$f''(x) < 0$ f concave down or slope is dec.

(a) f inc 7, 9, 12, 16
slope inc 2, 3, 4

b) f inc 7, 11, 14, 16
slope dec 4, 3, 2

c) f dec 16, 12, 9, 7
slope dec 4, 3, 2

d) f dec 16, 14, 11, 7
slope dec & inc 4, 3, 4

e) f dec 16, 13, 10, 7
slope constant 3, 3, 3

$\boxed{B}$

(91) $\int a(t) \rightarrow v(t)$

$v(1) = 2$

$v(2) = ?$

$v(t) = \int \ln(1 + 2^t)\,dt$

$v(2) - v(1) = \int_1^2 \ln(1 + 2^t)\,dt$

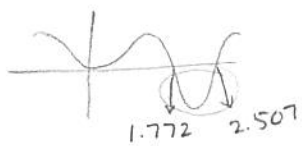
$v(2) = v(1) + \int_1^2 \ln(1 + 2^t)\,dt \rightarrow 2 + 1.346 \Rightarrow 3.346$ $\boxed{E}$

(92) $g(x) = \int_0^x \sin(t^2)\,dt$ g dec when $g'(x) < 0$

$g'(x) = \frac{d}{dx}\int_0^x \sin(t^2)\,dt$

$g'(x) = \sin(x^2)$ by 2nd F.T.C.

graph it & see where $g'(x) < 0$ (below x-axis)



$\boxed{D}$