Challenge Test: Multiple choice

(8.) Right: $3(6.2) + 5(5.9) + 3(5.6)$

(64.9) (A)

(3) $\int \sec x \tan x \, dx$

$= \sec x + C$

(A)

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(12) $u = \sqrt{x}$ $\quad du = \frac{1}{2\sqrt{x}} dx$

$u(1) = \sqrt{1} = 1$ $\quad 2du = 1/\sqrt{x} \, dx$

$u(4) = \sqrt{4} = 2$

$$\int_1^4 \frac{e^{\sqrt{x}}}{\sqrt{x}} dx \rightarrow \int_{1}^{4 \; 2} e^{\overset{u}{\sqrt{x}}} \overbrace{\frac{1}{\sqrt{x}} dx}^{2du} \rightarrow 2\int_1^2 e^u du \; \text{(C)}$$

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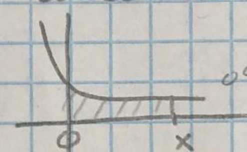
(26) $g'(x) = \int_0^x e^{-t^2} dt$

exp. decay

(A)

$g'(x) =$ area under



area is always (+) so $g'(x)$ is alway (+) from $0 < x < 2$ so always increasing

$g''(x) = e^{-x^2}$

exp decay

exp. are always + so $g''(x)$ is always + so concave up.

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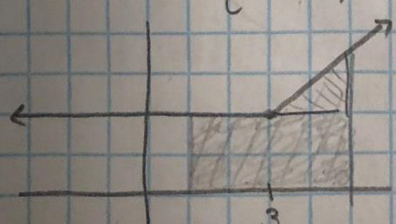
(13) $f(x) = \begin{cases} 2, & x < 3 \\ x-1, & x \geq 3 \end{cases}$ $\quad \int_1^5 f(x) \, dx$ (D)



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

$= 8 + 2$

$= 10$

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(79) average velocity $\rightarrow$ average value of velocity

(B)

$$\frac{1}{8-0}\int_0^8 v(t) dt \rightarrow \frac{1}{8}\int_0^8 v(t) dt$$

③

a.) $g(3) = \int_{-3}^{3} f(t)\,dt$

$= \frac{1}{2}(5)(4) + (\frac{1}{2})(2)(-4)$

$10 + -4$

6

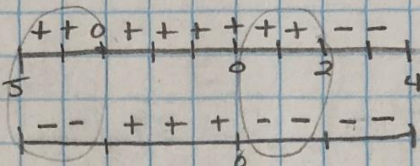
$g(x) = \int_{-3}^{x} f(t)\,dt$

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

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

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

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



values of f

slopes of f

increasing $(-5,-3)\ (-3,2)$

concave ↓ $(-5,-3)\ (0,4)$

$(-5,-3)\ (0,2)$ since $g'(x)$ is positive and $g''(x)$ is positive

c.) $h'(x) = \dfrac{g'(x) \cdot 5x - g(x) \cdot 5}{(5(x))^2}$

$h'(3) = \dfrac{(-2)(5)(3) - (6)(5)}{(5(3))^2} = \dfrac{-30-30}{225} = \dfrac{-60}{225} = \dfrac{-4}{15}$

d.) $p(x) = f(x^2 - x)$

$p'(x) = f'(x^2 - x) \cdot (2x - 1)$

$p'(-1) = f'(1+1) \cdot (2(-1)-1)$

$p'(-1) = f'(2) \cdot (-3)$

$p'(-1) = -2 \cdot -3$

$p'(-1) = 6$

90) $\int_6^{12} f(2x)\,dx = 10$ $u = 2x$ $u(6) = 12$

$du = 2dx$ $u(12) = 24$

$\frac{1}{2} du = dx$

(B)

$(\times 2)\ \frac{1}{2}\int_{12}^{24} f(u)\,du = 10(\times 2)$

$\int_{12}^{24} f(u)\,du = 20$

Free Response Question 1

a) $w(9) = 61.8$

$w(15) = 67.9$

$\frac{67.9 - 61.8}{15 - 9}\ \frac{°F}{min} = \frac{6.1}{6}\ F°/min$

the water temp is increasing at an approx rate of 1.017 °F/min

b.) $\int_0^{20} w'(t)\,dt = w(t)\Big|_0^{20}$

$= w(20) - w(0)$

$= 71° - 55°$

$= 16°F$

The water temperature increased by 16°F over the first 20 minutes

c.) $\frac{1}{20}\left(4(55) + 5(57.1) + 6(61.8) + 5(67.9)\right)$

60.79

since $W(t)$ is increasing, 60.79 is an underestimate.

d) Starting temp + accumulation

$W(20) + \int_{20}^{25} w'(t)\,dt$

$71 + \int_{20}^{25} .4\sqrt{t}\cos(0.06t)\,dt$

$71 + 2.04315$

73.04315