CH6 HW DAY 102 §6.4 ✓

p. 342-343 #4, 5, 11-15, 22-25 p. 323 #21, 29

(4) $f'(x) = \sin(x^2)$ $f(0) = 7$

$F(x) = f(0) + \int_0^7 \sin(x^2)dx = 7 + \int_0^7 \sin(x^2)dx$

(5) $f'(x) = \frac{\sin x}{x}$ $f(1) = 5$

$F(x) = f(1) + \int_0^1 \frac{\sin x}{x}dx = 5 + \int_0^1 \frac{\sin x}{x}dx$

(11) $\frac{d}{dx}\int_0^x \cos t^2\,dt = \cos x^2$

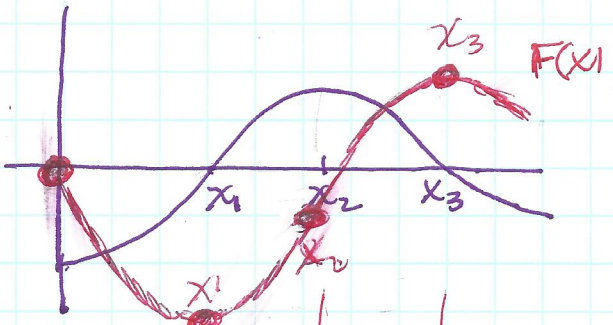
(12) $\frac{d}{dt}\int_4^t \sin(\sqrt{x})\,dx = \sin\sqrt{t}$

(13) $\frac{d}{dx}\int_1^x (1+t)^{200}dt = (1+x)^{200}$

(14) $\frac{d}{dx}\int_2^x \ln(t^2+1)\,dt = \ln(x^2+1)$

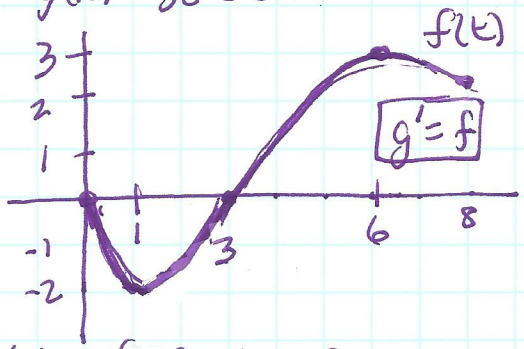
(15) $\frac{d}{dx}\int_{1/2}^x \arctan(t^2)\,dt = \arctan(x^2)$

(22) Sketch $F(x) = \int_0^x f(t)\,dt$



Behavior of $F(x)$ on intervals: dec ccu | inc ccu | inc ccd | dec ccd.

(24) $g(x) = \int_0^x f(t)\,dt$



a) $g(0) = \int_0^0 f(t)dt = 0$

b) $g'(1) = f(1) = -2$

c) g is concave up on $(1,6)$ b/c $g' = f$ is increasing $\therefore g'' = f' > 0$.

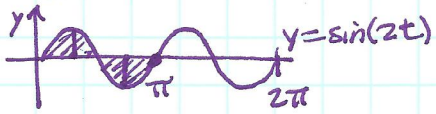
d) g has a max @ $x = 8$ b/c $\int_3^8 f(t)\,dt > 0$ and $\int_3^8 f(t)\,dt > \int_0^3 |f(t)|\,dt$

(25) $F(x) = \int_0^x \sin(2t)\,dt$

a) $F(\pi) = \int_0^\pi \sin(2t)\,dt = 0$

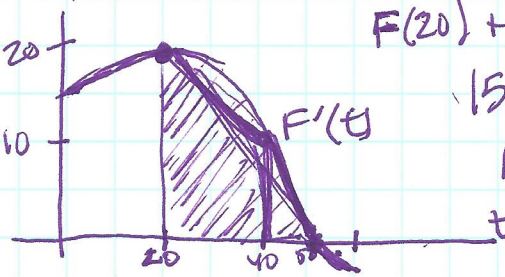
* can visualize graphically but otherwise would need calculator to evaluate formula.

b) areas are equal in size but opposite signs



c) $F(x)$ is positive $x \in (0,\pi) + \pi k$ for all values of x really.

(23) $F(20) = 150$ Max occurs at $t = 50$ b/c F' changes signs ⊕ to ⊖.



$F(20) + \int_{20}^{50} F'(t)dt = \text{MAX } F(x)$

$150 + \int_{20}^{40} F'(t)dt + \int_{40}^{50} F'(t)\,dt$

$150 + \frac{1}{2}(20)(20+10) + \frac{1}{2}(10)(10)$

$= 150 + 300 + 50 = 500 \approx F(50)$

This is an underestimate

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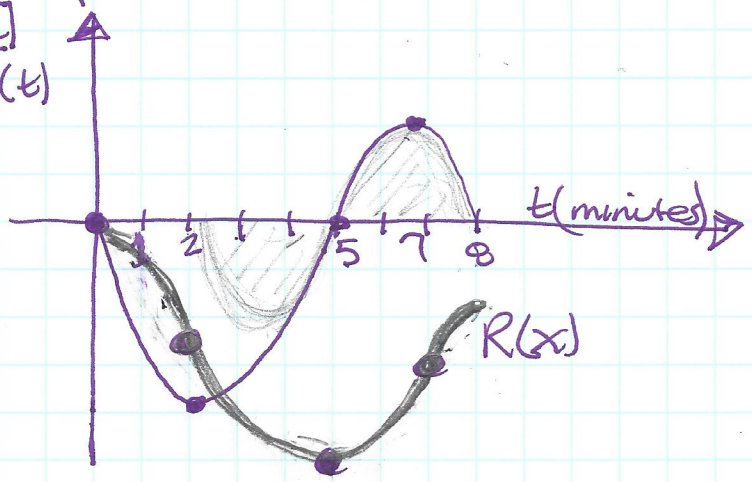
(21) graph shows rate of change of concentration of adrenaline in micrograms per milliliter per minute in person's body. Sketch concentration graph.

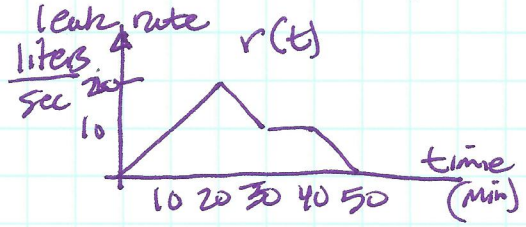
rate $r(t)$



$R(x) = \int_0^x r(t)\,dt$

$R' = r < 0$ on $(0,5)$,
$\therefore$ R is decreasing
$R' = r > 0$ on $(2,7)$
$\therefore$ R is increasing
$R' = r$ decreasing on $(0,2)(5,8)$
$\therefore$ R ccdown.
$R' = r$ increasing $(2,7)$
$\therefore$ R concave up.

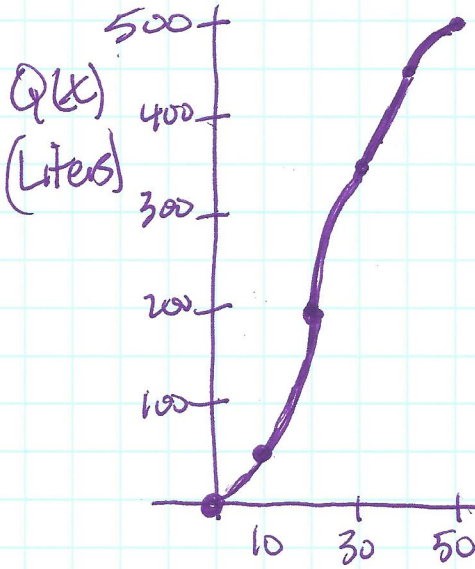
(29) graph = spillage rate at toxic waste treatment plant over 50 minutes it took to plug the leak.



$Q(x) = \int_0^x r(t)\,dt$

t (min)	0	10	20	30	40	50
Quantity (L)	0	50	200	350	450	500

Liters



Q always increasing
concave up on $(0,20)$
constant on $[30,40]$
concave down on $(20,30)(40,50)$