HW 6.4 p. 312 59, 61, 62, 65-70

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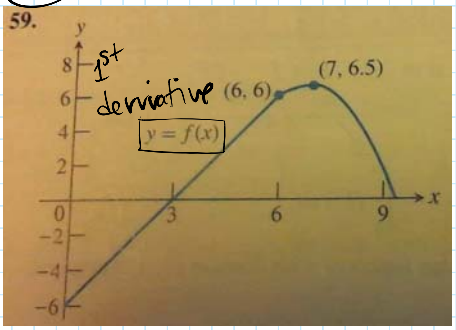
(59)



$s = \int_0^t f(x)\,dx$

(a) $v(3) = f(3) = \boxed{0}$

(b) $f'(3) > 0$ So acceleration is positive

(c) $s(3) = \int_0^3 f(x)\,dx = \frac{1}{2}(3)(-6) = \boxed{-9}$

(d) Passes thru origin at $t = 6$ sec bc

$s(6) = \int_0^6 f(x)\,dx = 0$

(e) $t = 7$ bc $f(x)$ is a max there

(f) $(0,3)$ away from origin (to left) $(s < 0$ and $f(x) < 0)$

$(3,6)$ towards origin $(s < 0$ and $f(x) > 0)$

$t = 6$ at origin

$(6,9)$ away from origin (to right) $(s > 0$ and $f(x) > 0)$

(g) at $t = 9$, particle lies on positive side of origin bc

$s(9) = \int_0^9 f(x)\,dx > 0$ (more area above x-axis than below)

(61) $f(x) = 2 + \int_0^x \frac{10}{1+t}\,dt$ at $x = 0$

point $(0,2)$

slope $= f'(x) = \frac{10}{1+x}$

$f'(0) = 10$

tangent line $y - 2 = 10(x - 0)$

$y = 10x + 2$

$\boxed{L(x) = 10x + 2}$

(62) $f(4)$ if $\int_0^x f(t)\,dt = x\cos\pi x$

$\frac{d}{dx}\int_0^x f(t)\,dt = \frac{d}{dx}[x\cos\pi x]$ Product rule, chain rule

$f(x) = \cos\pi x + x(-\sin\pi x)(\pi)$

$f(x) = \cos\pi x - x\pi\sin\pi x$

$f(4) = \cos(4\pi) - 4\pi\sin(4\pi)$

$= 1 - 0 = \boxed{1}$

(65) True. Fund. Thm of Calculus: F is differentiable, so it must be continuous.

(66) False. $\int_a^b e^{x^2}dx$ is a number, so its derivative $= 0$

(67) $f(x) = \int_a^x \ln(2+\sin t)dt$ $\quad f(3) = 4$ $\quad$ find $f(5)$

$$f(5) = f(3) + \int_3^5 \ln(2+\sin t)dt$$

$$= 4 + [.555]$$

$$= \boxed{4.555}$$

(68) $\lim_{h\to 0} \frac{1}{h}\int_x^{x+h} f(t)dt = \boxed{f(x)}$

(69) at $x=\pi$ linearization of $f(x) = \int_\pi^x \cos^3 t\,dt$

Point $f(\pi) = \int_\pi^\pi \cos^3 t\,dt = 0$

Slope $f'(x) = \cos^3 x$

$f'(\pi) = \cos^3 \pi = -1$

tangent line $y - 0 = -1(x-\pi)$

$y = -x + \pi$ $\boxed{E}$

(70) $\int_{-1}^{1} \sqrt{1-x^4}\,dx = 1.748$ $\boxed{E}$