

Chapter 5

Test Review

Evaluate the integral. (p. 282 #7)

$$\int_{-2}^1 5 \, dx = 5(3) = 15$$

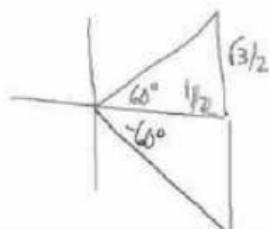
$$\int_{-2}^1 5 \, dx = [5x]_2^1 = 5 - (-10) = 15$$

Evaluate the integral. (p. 316 #26)

$$\int_1^2 \left(x + \frac{1}{x^2} \right) dx = \left[\frac{1}{2}x^2 - \frac{1}{x} \right]_1^2 = \left(2 - \frac{1}{2} \right) - \left(\frac{1}{2} - 1 \right) = 2 - \frac{1}{2} - \frac{1}{2} + 1 = 2$$

Evaluate the integral. (p. 316 #27)

$$\int_{-\frac{\pi}{3}}^0 (\sec x \tan x) dx = \left. \sec x \right|_{-\frac{\pi}{3}}^0$$
$$\cos(0) = 1$$
$$= \sec(0) - \sec\left(-\frac{\pi}{3}\right)$$
$$= 1 - 2$$
$$= -1$$



Use properties of integrals to answer the
following (p. 290 #1)

$$\int_1^2 f(x) dx = -4 \quad \int_1^5 f(x) dx = 6 \quad \int_1^5 g(x) dx = 8$$

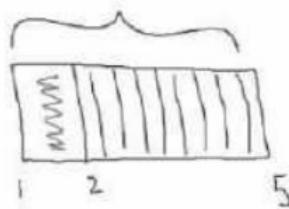
a) $\int_2^2 g(x) dx = 0$ b. $\int_5^1 g(x) dx = -\cancel{X} - 8$

e. $\int_1^5 [f(x) - g(x)] dx = \cancel{6} - 8 = -2$

Use properties of integrals to answer the
following (p. 290 #1)

$$\int_1^2 f(x) dx = -4 \quad \int_1^5 f(x) dx = 6 \quad \int_1^5 g(x) dx = 8$$

d. $\int_2^5 f(x) dx = 6 - (-4) = 10$



Use properties of integrals to answer the
following (p. 286 Ex. 1)

$$\int_{-1}^1 f(x) dx = 5 \quad \int_1^4 f(x) dx = -2 \quad \int_{-1}^1 h(x) dx = 7$$

a) $\int_4^1 f(x) dx = -2$ b. $\int_{-1}^4 f(x) dx = 5 + (-2)$
 $= 3$

e. $\int_1^1 [2f(x) + 3h(x)] dx = 10 + 21 = 31$

Find the average value of the function using
antiderivatives

p. 291 32

$$y = \frac{1}{x} \quad [e, 2e]$$

$$\begin{aligned}\text{Avg Value} &= \frac{1}{2e-e} \int_e^{2e} \frac{1}{x} dx = \frac{1}{e} \int_e^{2e} \frac{1}{x} dx = \frac{1}{e} \left[\ln x \right]_e^{2e} \\ &= \frac{1}{e} \left[\ln 2e - \ln e \right] = \boxed{\frac{\ln 2e - 1}{e}}\end{aligned}$$

Find dy/dx

p. 302 15

$$y = \int_{x^3}^5 \frac{\cos t}{t^2 + 2} dt$$

$$\frac{dy}{dx} = \frac{\cos(5)}{25+2} - \left(\frac{\cos(x^3)}{x^6+2} \right) 3x^2 = \boxed{\frac{-3x^2 \cos(x^3)}{x^6+2}}$$

Find dy/dx

p. 302 20

$$y = \int_{\sin x}^{\cos x} t^2 dt$$

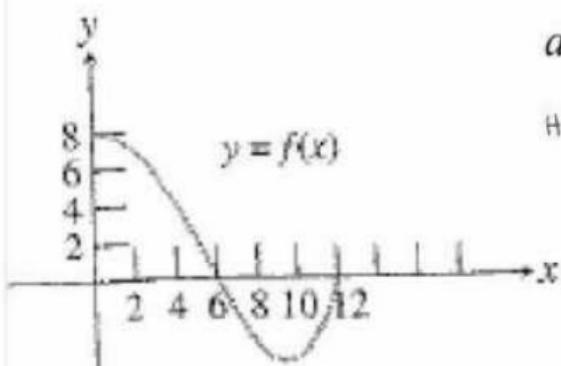
$$\frac{dy}{dx} = (\cos x)^2 (-\sin x) - (\sin x)^2 \cos x$$

Find the average value of $\sqrt{\cos x}$ on the
interval $[-1, 1]$

p. 303 52

$$\text{Avg Value} = \frac{1}{1 - (-1)} \int_{-1}^1 \sqrt{\cos x} dx = \frac{1}{2} \int_{-1}^1 \sqrt{\cos x} dx$$
$$= .9139$$

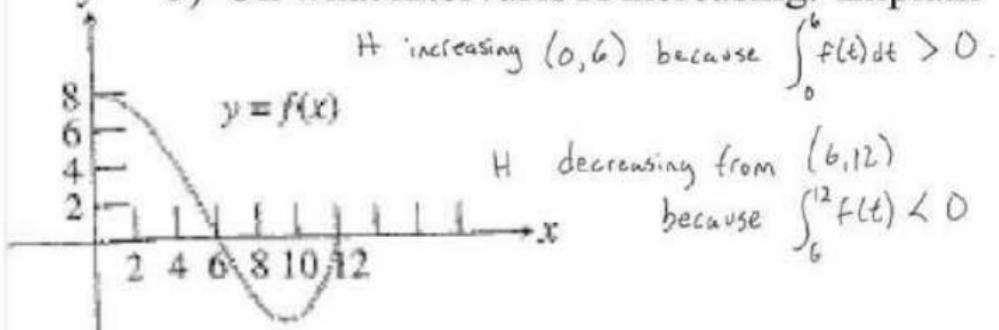
$H(x) = \int_0^x f(t) dt$, where f is the continuous function p.303 57
with domain $[0, 12]$ graphed here.



Area $\leftarrow H(x) = \int_0^x f(t) dt$
 y -values of given graph $H'(x) = f(x)$
 $H''(x) = f''(x)$
a) Find $H(0)$.
 $H(0) = \int_0^0 f(t) dt = 0$ slopes of graph

$H(x) = \int_0^x f(t)dt$, where f is the continuous function p.303 57
with domain $[0,12]$ graphed here.

b) On what interval is H increasing. Explain



$H(x) = \int_0^x f(t)dt$, where f is the continuous function p.303 57
with domain $[0, 12]$ graphed here.

$$H''(x) = f'(x)$$

slope of this graph

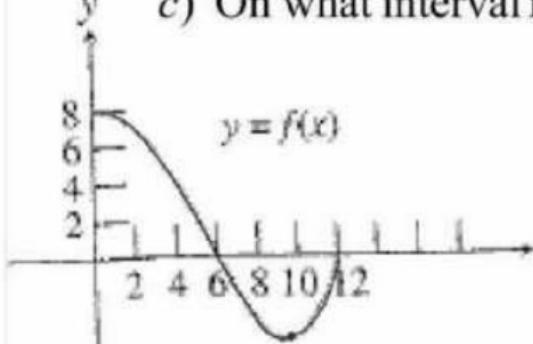
c) On what interval is H concave up. Explain

concave up slope of $f(x) > 0$

$$(10, 12)$$

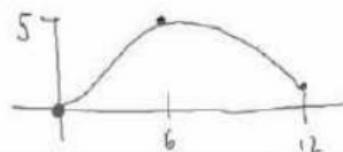
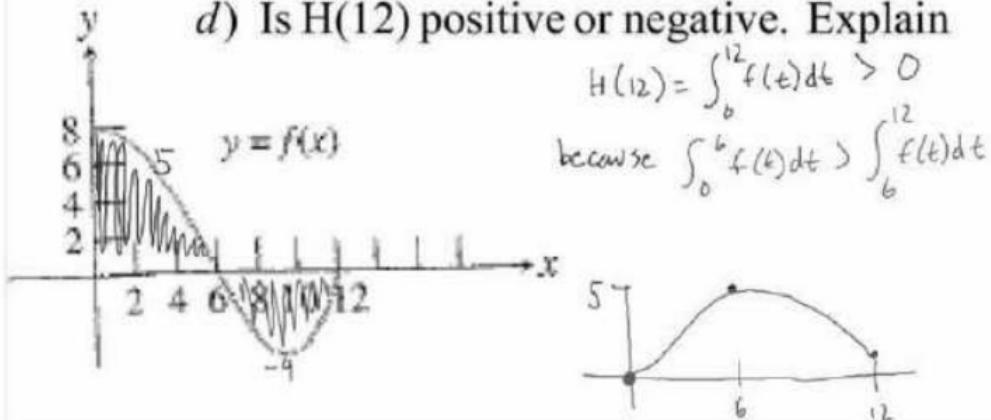
concave down slope of $f(x) < 0$

$$(0, 10)$$



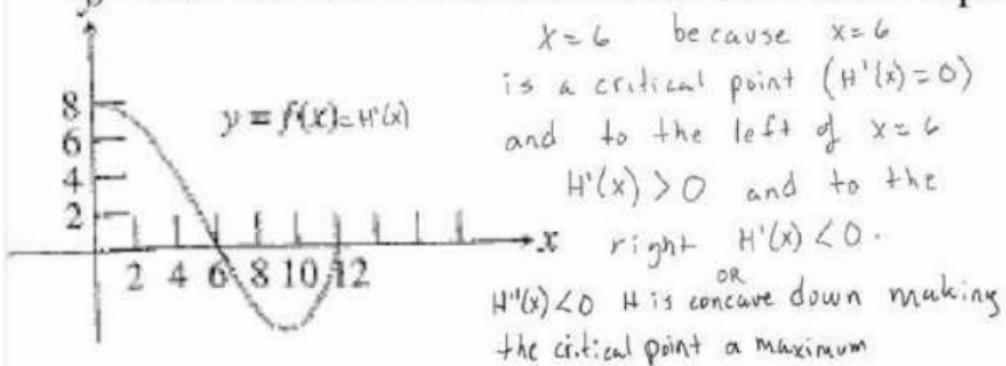
$H(x) = \int_0^x f(t)dt$, where f is the continuous function with domain $[0, 12]$ graphed here.

d) Is $H(12)$ positive or negative. Explain



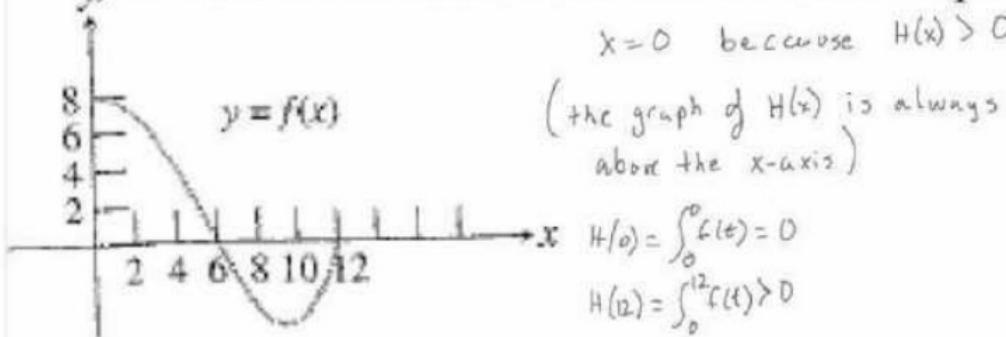
$H(x) = \int_0^x f(t)dt$, where f is the continuous function p.303 57
with domain $[0, 12]$ graphed here. The area changes from positive
to negative at $x=6$

e) Where does H achieve its maximum value. Explain



$H(x) = \int_0^x f(t)dt$, where f is the continuous function p.303 57
with domain $[0, 12]$ graphed here.

e) Where does H achieve its minimum value. Explain



f is the differentiable function whose graph is shown.

p.304 58

The position at time t (sec) of a particle moving

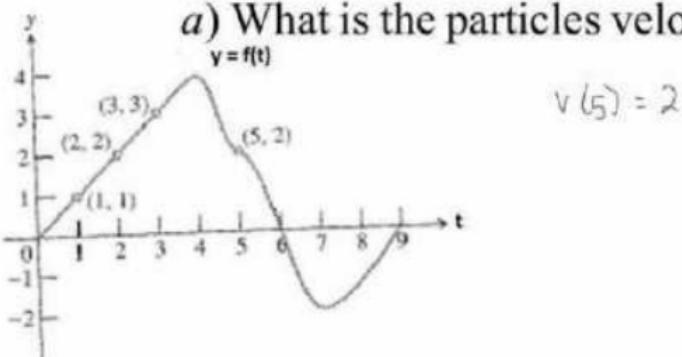
$$s = \int_0^t f(x) dx$$

along a coordinate axis is $s = \int_0^t f(x) dx$

$$v = f'(x)$$

$$a = f''(x)$$

a) What is the particles velocity at time $t = 5$?



$$v(5) = 2$$

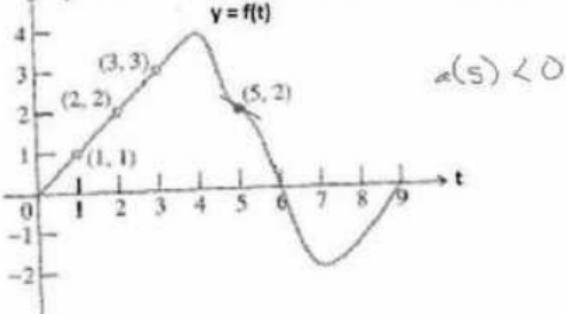
f is the differentiable function whose graph is shown.

p.304 58

The position at time t (sec) of a particle moving

along a coordinate axis is $s = \int_0^t f(x)dx$

b) Is the acceleration at time $t = 5$ positive or negative?



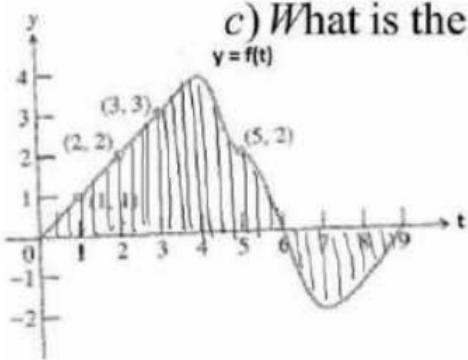
f is the differentiable function whose graph is shown.

p.304 58

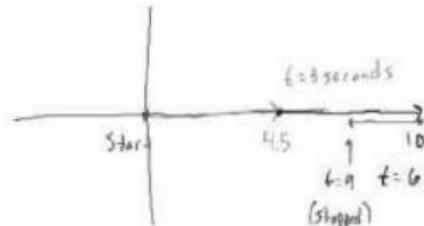
The position at time t (sec) of a particle moving

along a coordinate axis is $s = \int_0^t f(x)dx$

c) What is the particles position at time $t = 3$?



$$s = \int_0^3 f(x) dx = \frac{1}{2}(3)(3) = 4.5$$



f is the differentiable function whose graph is shown.

p.304 58

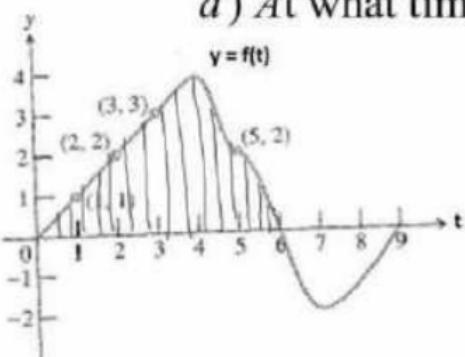
The position at time t (sec) of a particle moving

along a coordinate axis is $s = \int_0^t f(x)dx$

d) At what time during the first 9 seconds does

s have its largest value?

$$t=6 \quad \int_0^6 f(x)dx > \int_0^9 f(x)dx$$



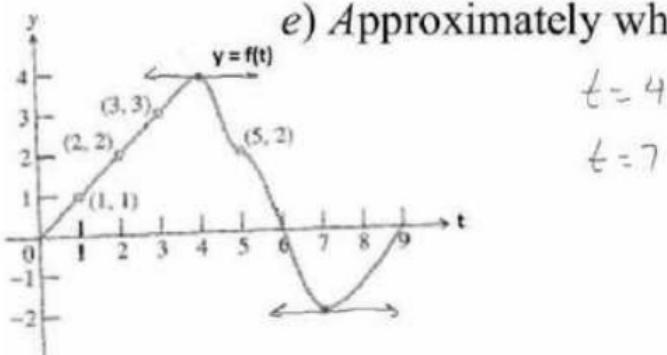
f is the differentiable function whose graph is shown.

p.304 58

The position at time t (sec) of a particle moving

along a coordinate axis is $s = \int_0^t f(x)dx$

e) Approximately when is acceleration 0?



$$t = 4$$

$$t = 7$$

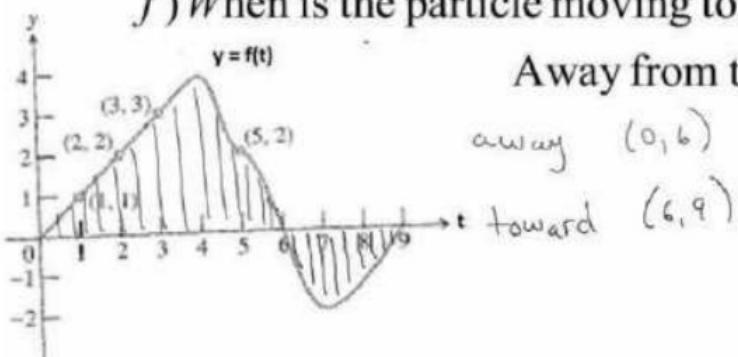
f is the differentiable function whose graph is shown.

p.304 58

The position at time t (sec) of a particle moving

along a coordinate axis is $s = \int_0^t f(x)dx$

f) When is the particle moving toward the origin?



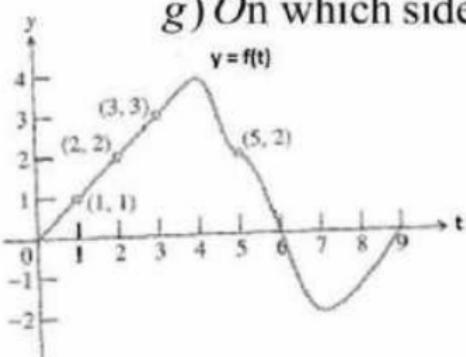
f is the differentiable function whose graph is shown.

p.304 58

The position at time t (sec) of a particle moving

along a coordinate axis is $s = \int_0^t f(x)dx$

g) On which side of the origin does the particle lie at time $t = 9$?



right side
because $\int_b^6 f(x)dx > \int_b^9 f(x)dx$

Evaluate the integral. (p. 291 #19)

$$\int_{\pi}^{2\pi} \sin x \, dx = -\cos x \Big|_{\pi}^{2\pi} = -\cos 2\pi - (-\cos \pi) \\ = -1 + (-1) \\ = -2$$

Evaluate the integral. (p. 291 #20)

$$\int_0^{\pi/2} \cos x \, dx = \left. \sin x \right|_0^{\pi/2} = \sin \frac{\pi}{2} - \sin(0)$$
$$= 1 - 0$$
$$= 1$$

Evaluate the integral. (p. 291 #21)

$$\int_0^1 e^x \, dx = \left. e^x \right|_0^1 = e^1 - e^0$$
$$= e - 1$$

Evaluate the integral. (p. 291 #30)

$$\int_1^4 -x^2 \, dx = \left[-\frac{1}{3}x^3 \right]_1^4 = -\frac{1}{3}(4)^3 - \left(-\frac{1}{3}(1)^3 \right)$$
$$= -\frac{1}{3}(64) + \frac{1}{3}$$
$$= -\frac{64}{3} + \frac{1}{3}$$
$$= -\frac{63}{3} = \boxed{-21}$$

RIEMANN sums

Use the data below to approximate the area under the curve using the Trapezoid Rule with 4 sub-intervals.

t	0	2	5	9	10
H(t)	66	60	52	44	43

$$\begin{aligned} & \frac{1}{2} h (b_1 + b_2) \\ A = & \frac{1}{2}(2)(66+60) + \frac{1}{2}(3)(60+52) + \frac{1}{2}(4)(52+44) + \frac{1}{2}(1)(44+43) \\ A = & 529.5 \end{aligned}$$

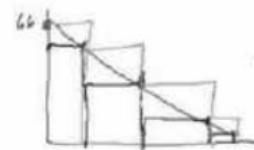
Use the data below to approximate the area under the curve using a Right Riemann Sum with 4 sub-intervals.

t	0	2	5	9	10
H(t)	56	60	52	44	43

$$A = l \cdot w$$

$$A = 2(60) + 3(52) + 4(44) + 1(43)$$

$$A = 495$$



Use the data below to approximate the area under the curve using a Left Riemann Sum with 4 sub-intervals.

t	0	2	5	9	10
H(t)	66	60	52	44	48

$$A = 2(66) + 3(60) + 4(52) + 1(44)$$

$$A = 564$$