Chapter 5 Review

1. Use the MRAM method (use 4 rectangles) to estimate how much water is leaked from the tank in the first 8 hours. Give units and a sentence that explains your answer.

A tank is leaking at an increasing rate as indicated by the data below. Use the table to answer the following questions.

| Time (hr) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| Leakage (gal/hr) | 30 | 50 | 150 | 240 | 320 | 410 | 550 | 650 | 720 |

2. If $\int_{1}^{5} f(x)\,dx = 8$, then find:

A. $\int_1^5 (f(x) + 3)\,dx$

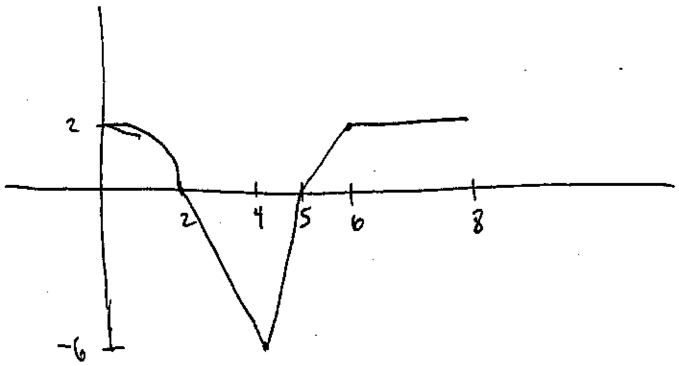
B. $\int_1^5 (f(x) - 6)\,dx$

3) Find the average value of $f(x)$ for $[-2, 3]$. Use your calculator to integrate.
$f(x) = 3x^5 + x^3 - 9x^2 - 1$

4) The function $f$ is continuous. The avg. value of $f$ from $[1,4]$ is 18. The average value from $[4,6]$ is 11. Find the average value of $f$ from $[1,6]$.

5) Find the total area between $f$ and the x-axis. Use your calculator. What integral(s) was used. Use the interval $[-2,6]$
$f(x) = -x^3 + 4x^2 - 2$

f is graphed below. $g(x) = \int_0^x f(x)\,dx$. The curved region is a quarter of a circle




(6) $g(8)$

(7) when is $g(x)$ increasing?

(8) when is $g(x)$ decreasing?

(9) when does $g(x)$ have an absolute min?

(10) when does $g(x)$ have an absolute max?

(11) what is $g'(4)$?

(12) when is $g(x)$ concave up?

(13) when is $g(x)$ concave down?

Find each derivative

(14) $\frac{d}{dx}\int_4^x \sqrt{t+3}\,dt$

(15) $\frac{d}{dx}\int_{-3}^{\sqrt{x}} t^2\,dt$

(16) $\frac{d}{dx}\int_{3x}^{x^2} t^3\,dt$

(17) $\frac{d}{dx}\int_{2/x}^{2x^3} \frac{3}{t}\,dt$

Find each antiderivative

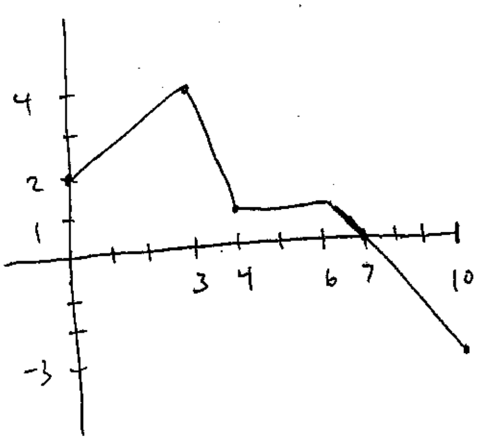
(18) $\int \left( \sqrt[4]{x^3} + \frac{6}{x^2} \right) dx$

(19) $\int 5^{3x}\, 3 \ln 5 \; dx$

(20) $\int 7^{2x}\, dx$

(21) $\int e^{5x}\, dx$

The position function for a particle moving along a coordinate axis for times [ ] is given by $s(t) = \int f(t)\,dt$. The graph of $f$ is shown below.




(22) What is the position of the particle

(A) after 3 seconds?

(B) after 4 seconds?

(C) after 7 seconds?

(D) after 10 seconds?

(E) What is the velocity of the particle at time $t = 3$?

at time $t = 10$?

(F) What is acceleration at time

| | | | |
|---|---|---|---|
| $t = 2$ | + | − | 0 |
| $t = 5$ | + | − | 0 |
| $t = 8$ | + | − | 0 |

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A tank is leaking at an increasing rate as indicated by the data below. Use the table to answer the following questions.

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| Leakage (gal/hr) | 30 | 50 | 150 | 240 | 320 | 410 | 550 | 650 | 720 |

2. If $\int_{1}^{5} f(x)\,dx = 8$, then find:

A. $\int_1^5 (f(x)+3)\,dx$

20

B. $\int_1^5 (f(x)-6)\,dx$

-16

③ Find the average value of f(x) for [-2, 3]. Use your calculator to integrate.

$f(x) = 3x^5 + x^3 - 9x^2 - 1$

$$\frac{238.75}{5} = 47.75$$

④ The function f is continuous. The avg. value of f from [1,4] is 18. The average value from [4,6] is 11. Find the average value of f from [1,6].

$54 + 22$

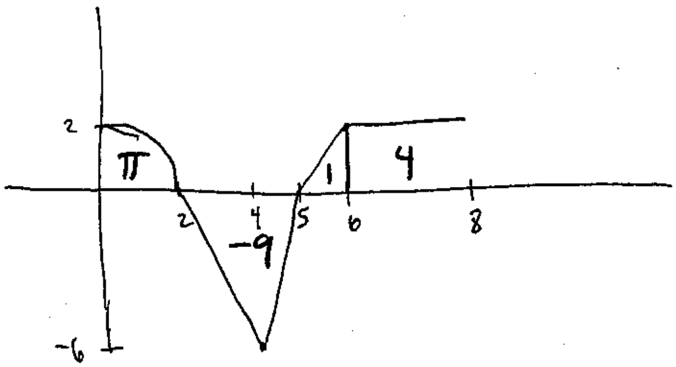
$$\frac{76}{\cancel{6}5} = 15.2$$

⑤ Find the total area between f and the x-axis. Use your calculator. What integral(s) was used. Use the interval [-2, 6]

$f(x) = -x^3 + 4x^2 - 2$

89.41

f is graphed below. $g(x) = \int_0^x f(x)\,dx$. The curved region is a quarter of a circle




(6) $g(8)$ $\quad \pi - 4$

(7) when is $g(x)$ increasing? $(0,2) \cup (5,8)$

(8) when is $g(x)$ decreasing? $(2,5)$

(9) when does $g(x)$ have an absolute min? $x = 5$

(10) when does $g(x)$ have an absolute max? 2

(11) what is $g'(4)$? $-6$

(12) when is $g(x)$ concave up? ~~(0,2) ∪ (2,4)~~ $(4,5)\ (5,6)\ (6,8)$

(13) when is $g(x)$ concave down? $(0,2) \cup (2,4)$

Find each derivative

(14) $\frac{d}{dx}\int_4^x \sqrt{t+3}\,dt = \sqrt{x+3}$

(15) $\frac{d}{dx}\int_{-3}^{\sqrt{x}} t^2\,dt = \frac{1}{2\sqrt{x}}\,x = \frac{\sqrt{x}}{2}$

$+2x^{-1}$ $\quad -\frac{2}{x^2}$

(16) $\frac{d}{dx}\int_{3x}^{x^2} t^3\,dt$ $\quad 2x^7 - 81x^3$

$2x \cdot x^6 - 27x^3 \cdot 3$

(17) $\frac{d}{dx}\int_{2/x}^{2x^3} \frac{3}{t}\,dt$ $\quad \frac{9}{x} + \frac{1}{3x}$

$6x^2 \cdot \frac{3}{2x^3} - \frac{x}{6} \cdot -\frac{2}{x^2}$ $\quad \frac{1}{x}\left(9 + \frac{1}{3}\right)$ $\quad \frac{28}{3x}$

Find each antiderivative

(18) $\int \left( \sqrt[4]{x^3} + \frac{6}{x^2} \right) dx$

$6x^{-2}$

$\sqrt[4]{x^7}$

$x^{3/4}$

$\frac{4}{7}x^{7/4} - \frac{6}{x}$

$\frac{4}{7}x\sqrt{x^3} - \frac{6}{x} + C$

(19) $\int 5^{3x}\, 3\ln 5 \, dx$

$5^{3x} + C$

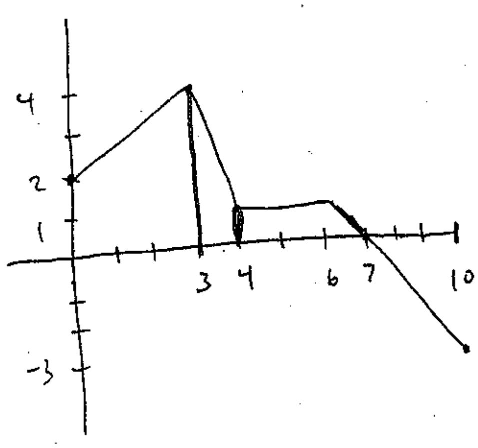
(20) $\int 7^{2x} \, dx$

$\frac{7^{2x}}{2\ln 7} + C$

(21) $\int e^{5x} \, dx$

$\frac{e^{5x}}{5} + C$

The position function for a particle moving along a coordinate axis for times [ ] is given by $s(t) = \int f(t)\,dt$ . The graph of f is shown below.




(22) What is the position of the particle

(A) after 3 seconds? 9

(B) after 4 seconds? 11.5

(C) after 7 seconds? 14

(D) after 10 seconds? 9.5

(E) What is the velocity of the particle at time $t = 3$? 4

at time $t = 10$? −3

(F) What is acceleration at time

| | | | |
|---|---|---|---|
| $t = 2$ | + | − | 0 |
| $t = 5$ | + | − | 0 |
| $t = 8$ | + | − | 0 |