Review Problem for Midterm #1

Midterm I: Friday, September 20 in class
Topics: 5.8 and 6.1-6.3
No calculator is allowed in the exam. You should know how to solve these problems without a calculator.

1. Evaluate the following indefinite integrals:

(a)
$$\int \frac{-2x^3 - x + 1}{x^2} dx$$

(b)
$$\int \frac{-2x^3 - x + 1}{\sqrt{x}} dx$$

(c)
$$\int (x-2)(x+3) dx$$

(d)
$$\int -4\sec^2(\frac{x}{2}) - 3\cos(2x) - 4\sin(\frac{x}{3}) dx$$

(e)
$$\int 4\sec(\frac{x}{2})\tan(\frac{x}{2}) - 4e^{\frac{x}{3}} dx$$

(f)
$$\int \frac{1-x^2}{1+x^2} - \frac{3}{\sqrt{1-x^2}} dx$$

(g)
$$\int 3^x - x^3 dx$$

2. Evaluate the following definite integrals:

(a)
$$\int_1^4 \frac{-2x^3 + 1}{\sqrt{x}} dx$$

(b)
$$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\cos(\frac{x}{3})}{2} dx$$

(c)
$$\int_{\frac{\pi}{18}}^{\frac{\pi}{9}} 4\sin(3x) dx$$

(d)
$$\int_{-1}^{1} \frac{1}{2x+1} dx$$

(e)

$$\int_0^2 \frac{1}{2x+1}dx$$

3. Suppose the value of the function f is shown in the following table

x	-1	-3/4	-1/2	-1/4	0	1/4	1/2	3/4	1
f(x)	1	-1	2	-2	3	0	-1	2	3

(a) Approximate $\int_0^1 f(x)dx$ using 4 equal subintervals and left endpoints.

(b) Approximate $\int_{-1}^1 f(x)dx$ using 4 equal subintervals and left endpoints.

4. Approximate $\int_1^3 (4x^2 - 5)dx$ using 4 equal subintervals and left endpoints.

5. Evaluate the following limits

(a)

$$\lim_{||P||\to 0} \sum_{k=1}^{n} (c_k^2 - 1)\Delta x_k$$

where $P = \{x_0 = 1, x_1, \cdots, x_k, \cdots, x_n = 2\}$, $c_k \in [x_{k-1}, x_k]$, $\Delta x_k = x_k - x_{k-1}$.

(b)

$$\lim_{||P||\to 0} \sum_{k=1}^{n} 3\sin(2c_k)\Delta x_k$$

where $P = \{x_0 = 0, x_1, \cdots, x_k, \cdots, x_n = \frac{\pi}{4}\}$, $c_k \in [x_{k-1}, x_k]$, $\Delta x_k = x_k - x_{k-1}$.

6. Express the area of the region enclosed by $y = x^2 - 1$ and $y = 5x + 5$ as an definite integral (**Do not evaluate the definite integral**).

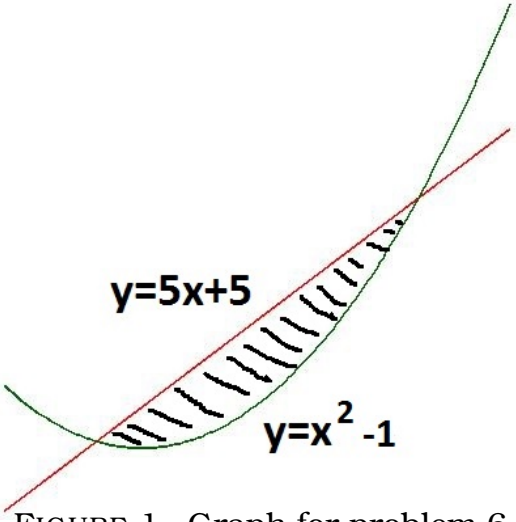

FIGURE 1. Graph for problem 6

7. **(a)** Express the area of the region enclosed by $y = -\sqrt{x+1}$, $y = -2x + 4$, $x-$axis and $y-$axis as an definite integral(**Do not evaluate the definite integral**).

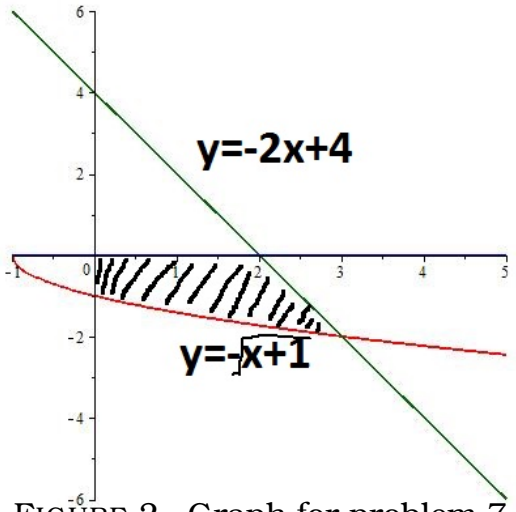

FIGURE 2. Graph for problem 7

(b) Express the volume of the solid obtained by rotating the above enclosed region about $x - axis$ as an definite integral(**Do not evaluate the definite integral**).

8. Express the area of the region enclosed by $y = -\sqrt{x}$, $y = x$ and $x = 4$ as an definite integral.

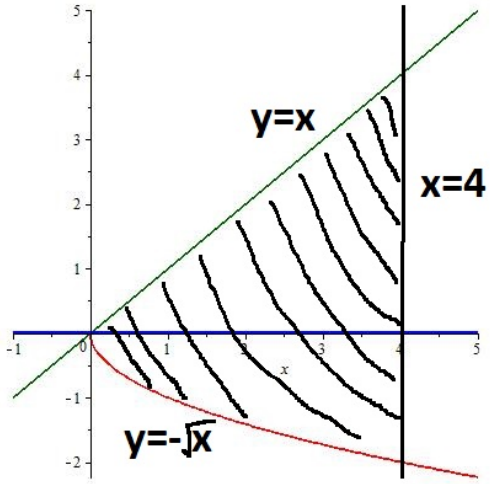

FIGURE 3. Graph for problem 8

9. **(a)** Express the area of the region enclosed by $y = 4x$, $y = 2x^2$ as an definite integral(**Do not evaluate the definite integral**).

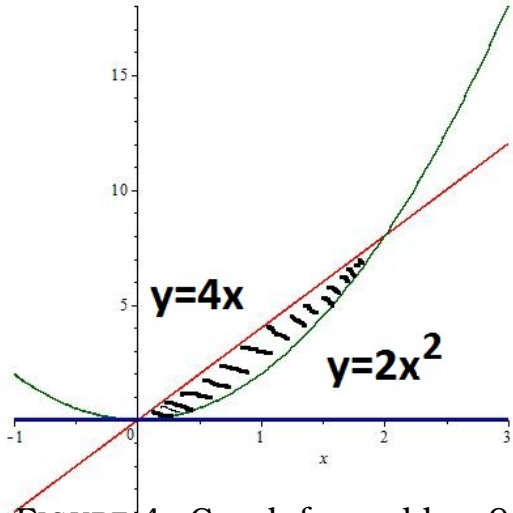

FIGURE 4. Graph for problem 9

(b) Express the volume of the solid obtained by rotating the above enclosed region about $x-axis$ as an definite integral(**Do not evaluate the definite integral**).