

# KEY

Name: \_\_\_\_\_

Math 1432  
Lab Quiz 1 (Version B)

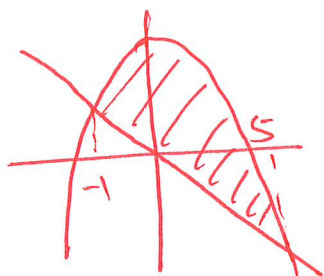
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Each question is worth 2 points.

1. Find the average value of  $f(x) = 4x^3 - 6x$  over the interval  $[-1, 2]$ .

$$\begin{aligned} \text{A.V.} &= \frac{1}{2-(-1)} \int_{-1}^2 (4x^3 - 6x) dx = \frac{1}{3} (x^4 - 3x^2) \Big|_{-1}^2 = \frac{1}{3} [(16 - 12) - (1 - 3)] \\ &= \frac{1}{3} [4 + 2] = 2 \end{aligned}$$

2. Find the area of the region enclosed by the graphs of  $f(x) = 5 - x^2$  and  $y = -4x$ . (Graph the region.)



$$\begin{aligned} 5 - x^2 &= -4x \\ x^2 - 4x + 5 &= 0 \\ (x - 5)(x + 1) &= 0 \\ x &= 5, -1 \end{aligned}$$

$$\begin{aligned} \text{Area} &= \int_{-1}^5 (5 - x^2) - (-4x) dx \\ &= \int_{-1}^5 5 - x^2 + 4x dx \\ &= 5x - \frac{x^3}{3} + 2x^2 \Big|_{-1}^5 \\ &= (25 - \frac{125}{3} + 50) - (-5 + \frac{1}{3} + 2) \\ &= 75 - \frac{125}{3} + 3 - \frac{1}{3} = 78 - \frac{126}{3} \\ &= 78 - 42 = 36 \end{aligned}$$

3. Evaluate:  $\int \frac{4x+2}{x^2+9} dx = 4 \int \frac{x}{x^2+9} dx + 2 \int \frac{dx}{x^2+9}$

$$\begin{aligned} u &= x^2 + 9 \\ du &= 2x dx \end{aligned}$$

$$\begin{aligned} &= 2 \int \frac{du}{u} + 2 \int \frac{dx}{x^2+9} \\ &= 2 \ln|u| + \frac{2}{3} \tan^{-1} \frac{x}{3} + C = 2 \ln|x^2+9| + \frac{2}{3} \tan^{-1} \frac{x}{3} + C \end{aligned}$$

4. Evaluate:  $\int x^2 \sqrt{x^3+1} dx = \frac{1}{3} \int \sqrt{u} du$

$$\begin{aligned} u &= x^3 + 1 \\ du &= 3x^2 dx \\ \frac{du}{3} &= x^2 dx \end{aligned}$$

$$\begin{aligned} &= \frac{1}{3} \int u^{1/2} du \\ &= \frac{1}{3} \frac{u^{3/2}}{3/2} + C = \frac{2}{9} (x^3+1)^{3/2} + C \end{aligned}$$

5. Evaluate:  $\int \frac{\cos(x)}{1+4\sin(x)} dx$

$$\begin{aligned} u &= 1 + 4\sin(x) \Rightarrow du = 4\cos(x) dx \\ &\Rightarrow \frac{du}{4} = \cos(x) dx \end{aligned}$$

$$\begin{aligned} &= \frac{1}{4} \int \frac{du}{u} \\ &= \frac{1}{4} \ln|u| + C = \frac{1}{4} \ln|1+4\sin(x)| + C \end{aligned}$$