

MATH 132, SEC. 21, SAMPLE MIDTERM 4

1. Perform the following integrals and/or derivatives:

a. $\int (2x^3 - 3) dx$

b. $\int_{-\pi}^{\pi/2} \cos(2t) dt$

c. $\int_{-1}^1 \sqrt{1-x^2} dx$

d. $\int_{-1}^1 x\sqrt{1-x^2} dx$

d. $\int \frac{1}{\theta^2} \sin \frac{1}{\theta} \cos \frac{1}{\theta} d\theta$

e. $\int_0^1 \frac{x^3}{\sqrt{x^4+9}} dx$

f. $\int_0^{\pi/4} \tan^2(3t) \sec^2(3t) dt$

g. $\int_0^{\pi/2} 3f(\sin x) \cos x dx$, assuming that $\int_0^1 f(x) dx = \pi^2$.

h. $\frac{d}{dx} \int_4^x e^{-\frac{1}{2}t^2} dt$

i. $\frac{d}{dx} \int_x^{x^3} \sqrt{1-2\sin^2 \theta} d\theta$

2. Calculate the integral $\int_1^4 2x dx$ using the **definition** of the definite integral. You may use these following formulas:

$$\sum_{k=1}^N k = \frac{N(N+1)}{2}, \quad \sum_{k=1}^N k^2 = \frac{N(N+1)(2N+1)}{6}, \quad \sum_{k=1}^N k^3 = \left(\frac{N(N+1)}{2}\right)^2$$

3. Estimate $\int_0^{\pi} \sin(x) dx$ using 4 rectangles with left-hand endpoints. Draw this on the enclosed graph (not enclosed on practice exam).

4. Calculate the sum $\sum_{k=0}^5 3k - 5k^3$. (You may leave your answer in terms which would be easy to plug into a calculator.)

5. Find the area bounded by the curves $y = 0, y = x - 2, y = \frac{1}{2}x^2, x = 4$.

6. Find the average value of the function $y = \sqrt{x}$ on the interval $[1, 4]$.