

Name: _____

Each problem is worth 15 points. Show all your work for full credit; numerical or graphical estimates are unacceptable unless specifically requested.

1. Use the definition of the definite integral to find

$$\int_3^6 x^3 dx$$

2. Use a midpoint sum with n subintervals to approximate

$$\int_3^6 x^3 dx$$

for

- (a) $n = 6$
- (b) $n = 30$
- (c) $n = 100$
- (d) $n = 999$

Write out the complete sum for part 2a, including the values of a , b , Δx , and all the x_k 's.

3. Evaluate the following indefinite integrals:

(a) $\int \frac{1}{4^x} dx$

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

(c) $\int \csc^2 t dt$

(d) $\int \sin \theta d\theta$

(e) $\int \frac{y^2-5y+3}{\sqrt{y}} dy$

(f) $\int \tan x dx$

4. Suppose water drips from a leaky drainage pipe onto the floor below at a rate given (in ml/min) by $r(t) = 5 - \frac{5}{t^2+1}$. Find

$$\int_0^{2880} r(t) dt$$

Give units and interpret your answer.

5. Suppose the velocity of a particle at time t is given (in m/s) by $v(t) = t^2 + t - 12$. Find the distance traveled by the particle during the first 6 seconds.

6. Evaluate:

$$\int_{-3}^4 \frac{\tan^{-1} t - 1}{t^2 + 1} dt$$

7. Evaluate:

$$\frac{d}{dx} \int_0^x \frac{\sqrt{1-t^2}}{\sin^2(t^3)} dt$$