

Instructions: Listen to your TA's instructions. There are substantially more problems on this worksheet than we expect to be done in discussion, and your TA might not have you do problems in order. The worksheets are intentionally longer than will be covered in discussion in order to give students additional practice problems they may use to study. Do not worry if you do not finish the worksheet :).

1. Find the general indefinite integrals.

(a) $\int x\sqrt{x} \, dx$

(b) $\int (1-t)(2+t^2) \, dt$

(c) $\int 13 + 2t^4 \, dt$

(d) $\int \cos(u+3) \, du$

(e) $\int (s+3)^2 \, ds$

$$(f) \int \frac{3x^3 + 5x^2 - 1}{3x^2} dx$$

$$(g) \int \sqrt{t} - \frac{2}{\sqrt{t}} dt$$

$$(h) \int (x^2 + 1)^2 dx$$

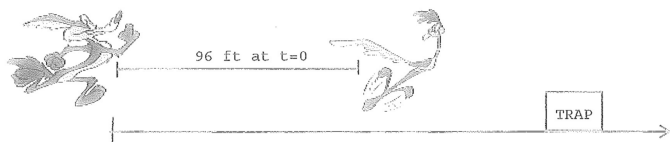
2. Water flows from the bottom of a storage tank at a rate of $r(t) = 200 - 4t$ liters per minute, where $0 \leq t \leq 50$. Find the amount of water that flows out of the tank during the first ten minutes.

3. If $w'(t)$ is the rate of growth of a child in pounds per year, what does $\int_5^{10} w'(t) dt$ represent?

4. A honeybee population starts with 100 bees and increases at a rate of $n'(t)$ bees per week. What does $100 + \int_0^{15} n'(t) dt$ represent?

5. A particle is moving with an acceleration of $a(t) = 2t + 5$ m/s². The initial velocity of the particle is $v(0) = 4$, with $0 \leq t \leq 10$. Find the velocity at time t , as well as the total distance traveled.

6. A coyote is chasing a roadrunner in a straight line. Suppose the roadrunner has a head start of 96 ft. Suppose the coyote is running at a speed of $4t$ ft/sec, and that the road runner is running at a speed of 4 ft/sec.



(a) Has the coyote caught up with the roadrunner after 7 seconds?

(b) Has the coyote caught up with the roadrunner after 8 seconds?

- (c) The roadrunner has set a trap for the coyote 120 ft from the coyote's starting point. Will the roadrunner be able to escape from the coyote? That is, will the coyote get to the trap before he catches the roadrunner?

7. Try to find an antiderivative for each of the following functions. (Note: you may not be able to find one for some).

(a) $f(x) = \sin(2x)$

(b) $f(x) = \sin(x + 4)$

(c) $f(x) = \sin(x^2)$

(d) $f(x) = 2x \sin(x^2)$

(e) $f(x) = (x - 1)$

(f) $f(x) = (x - 1)^2$

(g) $f(x) = \sqrt{x - 1}$

(h) $f(x) = \sqrt{x^2 - 1}$

8. Use a substitution to compute the following integrals.

(a) $\int \sin(2x) dx$

(b) $\int \sin(x + 4) dx$

(c) $\int 2x \sin(x^2) dx$

(d) $\int (x - 1) dx$

(e) $\int (x - 1)^2 dx$

(f) $\int \sqrt{x - 1} dx$

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