Session 9: Sections 4-1, 4-2, and part of 4-3

1. Determine if $F(t) = 7t + et + C$ is the antiderivative of $f(t) = 7 + e$

2. Determine the following indefinite integrals.

   (a) $\int x^4 \, dx$

   (b) $\int \frac{1}{\sqrt{x}} \, dx$

   (c) $\int 4t^4 - 5t - 6 \, dt$

   (d) $\int \sqrt[3]{x^2} - 3x^{1/4} \, dx$

   (e) $\int \frac{4x^4 - 5x^3}{x^2} \, dx$

3. Find $F(t)$ such that $F'(t) = \dfrac{1-t^4}{t^3}$ and $F(1) = 4$.

4. The daily marginal revenue function for the BlackDay Sunglass Company is given by

$$MR(x) = 30 - 0.00003x^2, \quad 0 \leq x \leq 1732$$

where x represents the number of sunglasses produced and sold. Recover the revenue function R and find the price at which the sunglasses should be sold to obtain maximum revenue.

5. Find the following indefinite integrals.

(a) $\int 2x(x^2+15)^{14}\ dx$

(b) $\int x^6 e^{x^7} dx$

(c) $\int \frac{16x^7}{(3-x^8)^2}\ dx$

(d) $\int 3x\sqrt{8-x^2}\ dx$

(e) $\int \frac{15x^3}{3+5x^4}\ dx$

(f) $\int \frac{e^x + 5e^{-5x}}{(e^x - e^{-5x})^4}\ dx$

(g) $\int \frac{x}{\sqrt{x-2}}\ dx$ **(challenging)

6. A contaminated lake is treated with a bactericide. The rate of increase in harmful bacteria t days after the treatment is given by the function

$$\frac{dN}{dt} = \frac{-3000t}{(1+t^2)}$$

for $0 \leq t \leq 8$. $N(t)$ is the number of bacteria per milliliter of water.

(a) Find the absolute minimum value of $\frac{dN}{dt}$.

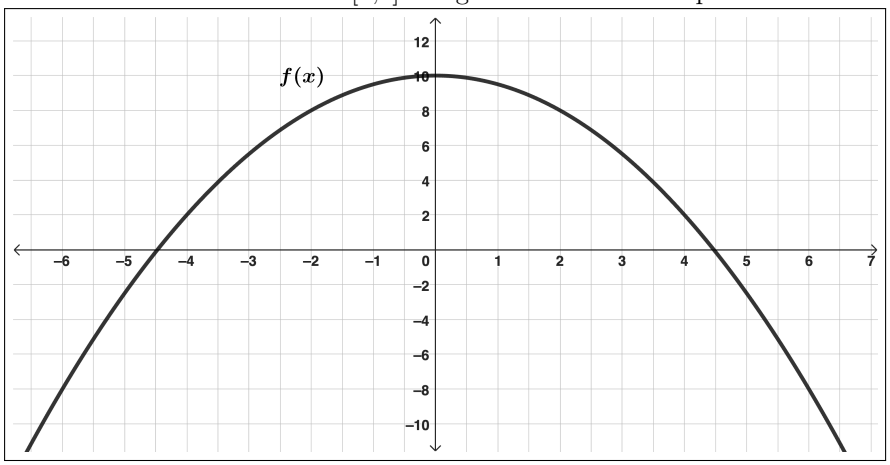
(b) If the initial count was 8000 bacteria per milliliter, find $N(t)$ and then find the bacteria count after 8 days.

(c) When is the bacteria count 3821 bacteria per milliliter? (Round answers to two decimal places.)

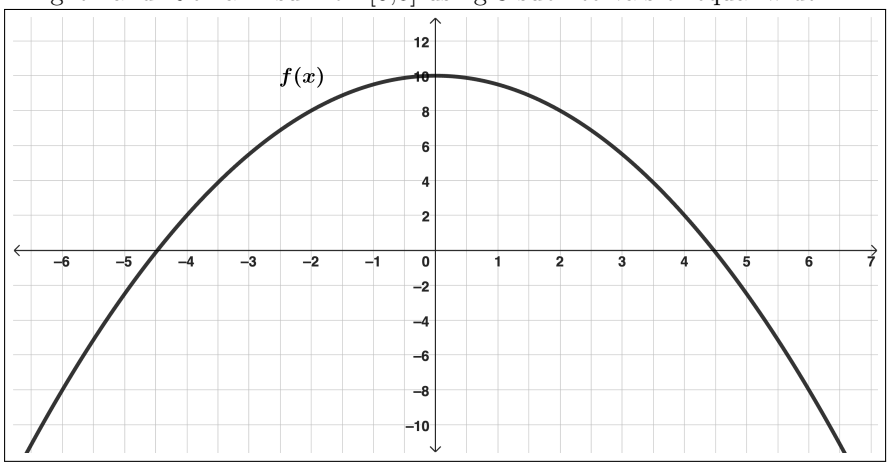
7. The weekly marginal profit function for Shoe Fly, a company that makes insect themed footwear, is given by $P'(x) = 30 + 50xe^{-0.01x^2}$ dollars per pair of shoes when x pairs of shoes are sold each week. Find Shoe Fly's weekly profit function when x pairs of shoes are sold each week if it is known they have a profit loss of \$2300 when no shoes are sold.

8. Use the graph of $f(x)$ below to calculate the following:

(a) A left-hand Riemann sum on [0,6] using 3 subintervals of equal width.



(b) A right-hand Riemann sum on [0,6] using 3 subintervals of equal width.



9. The table below gives the velocity of a runner (in feet per second) for the first 6 seconds of her race. Use the table, estimate the distance traveled by the runner from $t = 0$ to $t = 6$ using a right-hand Riemann sum with 4 equal subintervals. (Rounded answers to one decimal.)

t (sec)	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
$s(t)$ (ft/sec)	0	3.2	5.6	6.7	8.8	9.2	11.1	12.0	16.3	20.5	21.2	24.7	22.9

10. Estimate $\int_2^5 (9 - x^2)\, dx$ using left-side Riemann sums and 6 sub-intervals of equal width.