

**Due: August 18, 2023**

1. Find all antiderivatives:

a)  $x^5$

b)  $9x^3 - x + 3$

c)  $x$

d)  $1$

e)  $\sqrt{x}$

f)  $\frac{1}{x^{10}}$

g)  $\frac{5}{x}$

2. For the following exercises, find the antiderivative of the function for the provided endpoints, and compute the area under the curve on that interval.

a)  $f(x) = x^2$ ;  $1 \leq x \leq 3$ ,  $n = 4$

b)  $f(x) = x^3$ ;  $1 \leq x \leq 3$ ,  $n = 5$

c)  $f(x) = x^3$ ;  $0 \leq x \leq 1$ ,  $n = 5$

3. Calculate the following definite integrals:

a)  $\int_1^1 x dx$

b)  $\int_1^2 5 dx$

c)  $\int_1^2 8x^3 dx$

d)  $\int_0^1 4e^{-3x} dx$

e)  $\int_1^4 3\sqrt{x} dx$

f)  $\int_0^5 e^{-2x} dx$

g)  $\int_3^6 x^{-1} dx$

h)  $\int_0^3 (x^3 + x - 7) dx$

4. Bonus! We've talked a lot about linear regression in the last 2 weeks, and we know we can compute regression coefficients with  $\beta = (X^T X)^{-1} X^T Y$ . Given that  $X$  is the left hand side and  $Y$  the right, find  $\beta$ . Then use elementary row operations to solve the augmented matrix as given. What do you notice about the results from the regression and those from solving the linear system?

$$\left[ \begin{array}{cc|c} 3 & 4 & 2 \\ 1 & 1 & 1 \end{array} \right]$$