

## 1 | Problem 1

Differentiate (with respect to x)

1.1 | (a)

$$y = x^2 + x^{74} - \ln x - \log_3 x + 51^x - e^x + \sin x - \cos x$$

$$\left[ \frac{d}{dx}[y] = 2x + 74x^{73} - \frac{1}{x} - \frac{1}{x \ln(3)} + \ln(51) * 51^x - e^x + \cos x + \sin x \right]$$

1.2 | (c)

$$f(x) = 7 + x^2 + 6x^3 + 3\sqrt[4]{x} + \frac{1}{x} - \ln x + 5^x$$

$$\left[ \frac{d}{dx}[f(x)] = 2x + 18x^2 + \frac{3}{4\sqrt[4]{x^3}} - \frac{1}{x} + \ln(5)5^x \right]$$

## 2 | Problem 2

Sketch the function  $f(x) = 2x^5 - 10x^4 - 70x^3$ , and label  $(x, y)$  of intercepts, maxima, and minima.

KBdMATH520Day1HWProblem2.jpg

## 3 | Problem 5

Find antiderivatives

4 | (a)

$$\int x^4 + 3x^8 - 12x^7 + 14 dx$$

$$\left[ \begin{aligned} &= \int x^4 dx + \int 3x^8 dx - \int 12x^7 dx \\ &= \frac{1}{5}x^5 + \frac{1}{3}x^9 - \frac{3}{2}x^8 + C \end{aligned} \right]$$

5 | (d)

$$\left[ \int 323(4x^3 + 3x^2)(x^4 + x^3)^{322} dx = (x^4 + x^3)^{323} + C \right]$$

## 6 | Problem 6

$$f(x) = 2x^5 - 10x^4 - 70x^3$$

6.1 | (a)

$$\begin{aligned}
 f(x) &= 2x^5 - 10x^4 - 70x^3 \\
 \text{Area underneath function from } x = -4 \text{ to } x = -1: & \int_{-4}^{-1} f(x) dx = \int_{-4}^{-1} 2x^5 - 10x^4 - 70x^3 dx \\
 &= \left[ \frac{1}{3}x^6 - 2x^5 - \frac{70}{4}x^4 \right]_{-4}^{-1} \\
 &= -\frac{23775}{7}
 \end{aligned}$$