1 | **Problem 1**

Differentiate (with respect to x)

1.1 | (a)

$$y = x^2 + x^{74} - \ln x - \log_3 x + 51^x - e^x + \sin x - \cos x$$
$$\frac{d}{dx}[y] = 2x + 74x^{73} - \frac{1}{x} - \frac{1}{x \ln(3)} + ln(51) * 51^x - e^x + \cos x + \sin x$$

1.2 | (c)

$$f(x) = 7 + x^2 + 6x^3 + 3\sqrt[4]{x} + \frac{1}{x} - \ln x + 5^x$$
$$\frac{d}{dx}[f(x)] = 2x + 18x^2 + \frac{3}{4\sqrt[4]{x^3}} - \frac{1}{x} + \ln(5)5^x$$

2 | **Problem 2**

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

3 | **Problem 5**

Find antiderivatives

4 | (a)

$$\int x^4 + 3x^8 - 12x^7 + 14 \, dx$$
$$= \int x^4 \, dx + \int 3x^8 \, dx - \int 12x^7 \, dx$$
$$= \frac{1}{5}x^5 + \frac{1}{3}x^9 - \frac{3}{2}x^8 + C$$

5 | (d)

$$\int 323(4x^3 + 3x^2)(x^4 + x^3)^{322} \, dx = (x^4 + x^3)^{323} + C$$

6 | **Problem 6**

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

6.1 | (a)

Area underneath function from $x = -4$ to $x = -1$:

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

$$\int_{-4}^{-1} f(x)\, dx = \int_{-4}^{-1} 2x^5 - 10x^4 - 70x^3\, dx$$

$$= [\frac{1}{3}x^6 - 2x^5 - \frac{2}{35}x^4]_{-4}^{-1}$$

$$= -\frac{23775}{7}$$