MATH 122
Exam 2 Review — Solutions

Problem 1.

(a) $f'(x) > 0$: $(-2, \infty)$; $f'(x) < 0$: $(-\infty, -2)$

(b) $f''(x) > 0$: $(-\infty, \infty)$; $f''(x) < 0$: Nowhere

(c) $x = -2$, local min

(d) None

(e) $f(-6) > 0$, $f'(1) > 0$, $f''(-3) > 0$, $f'(-2) = 0$

(f) A line touching $f(x)$ only at $x = -5$ with the same 'slope.' [Sketch this yourself!]

Problem 2.

(a) $20x^3 - 7 + \frac{2}{3}x^{-2/3} + 0$

(b) $12x^3 \log_5 x + 3x^4 \cdot \dfrac{1}{x \ln 5}$

(c) $8(e^x - 4)^7 \cdot e^x$

(d) $\dfrac{5(2x+4) - 2(5x-1)}{(2x+4)^2}$

Problem 3.

(a) Increasing: $(2, 8)$; Decreasing: $(-\infty, 2) \cup (8, \infty)$

(b) $x = 2$: local min; $x = 8$: local max

(c) Concave up: $(-\infty, 5)$; Concave Down: $(5, \infty)$

(d) $x = 5$

Problem 4.

(a) $6x^5 \cdot 4^{-x} \log_2(3x) + (-4^x \ln 4) \cdot x^6 \log_2(3x) + \dfrac{3}{3x \ln 2} \cdot x^6 4^{-x}$

(b) $6(x9^{\sqrt{x}} - 5)^5 \cdot \left(1 \cdot 9^{\sqrt{x}} + x \cdot 9^{\sqrt{x}} \ln 9 \cdot \dfrac{1}{2}\, x^{-1/2} - 0\right)$

(c) $\dfrac{\left(3^x \ln 3 \cdot \ln x + 3^x \cdot \dfrac{1}{x}\right)(5x-4) - 5(3^x \ln x)}{(5x-4)^2}$

Problem 5.

(a) Using $h = 0.001$, we find $C'(2) \approx 12.003$.

(b) $C'(2) = 12$

(c) $y = 12x + 138$

(d) 164.4

(e) Underestimate

Problem 6.

(a) Increasing: $(-\infty, -5) \cup (4, \infty)$; Decreasing: $(-5, 4)$

(b) Concave Down: $(-\infty, -\frac{1}{2})$; Concave Up: $(-\frac{1}{2}, \infty)$

(c) $x = -\frac{1}{2}$

(d) $x = -5$: local maxima; $x = 4$: local minima

(e) Global Maxima: 236 at $x = -2$; Global Minima: -304 at $x = 4$