Math 112 Midterm 2 Practice Problems — Solutions

Integral Problems

1. $\frac{1}{3}e^x - \frac{2}{3}e^{-3x} + C$

2.

  (a) Approximately 8.5

  (b) Approximately 3

3.

  – Equilibrium point: quantity 4, price 2.

  – Consumer's surplus: $9\ln 9 - 8 \approx 11.78$

  – Producer's surplus: $16\ln 2 - 8 \approx 3.09$

4.

  (a) No relative minima/maxima! The only critical point is $x = -1$; it's a horizontal point of inflection.

  (b) Concave up for $x > 1$; concave down for $x < 1$.

  (c) Absolute minimum: -1 (at $x = 0$); absolute maximum: 1 (at $x = 2$).

5.

  (a) On $[0, 10]$, the global minimum is ≈ -3 (at $x = 5$) and the global maximum is ≈ 0 (at $x = 0$), although $x = 10$ is also close, and may actually be the global max (sorry, bad question!). On $[0, 12]$, the global minimum is the same (≈ -3) and the global maximum is ≈ 1 (at $x = 12$).

  (b) Global minimum is ≈ -0.9 (at $x \approx 2.2$), and the global maximum is 0 (at $x = 0$).

  (c) Global minimum is ≈ -1 (at $x = 0$), and the global maximum is ≈ 0.2 (at $x = 3$).

6.

  (a) On $[0, 3]$, the global minimum is 0 (at $x = 0$ and $x = 2$), and the global maximum is $\frac{9}{4}$ (at $x = 3$). On $[0, 1.5]$, the global minimum is still 0 (at $x = 0$) and the global maximum is $\frac{1}{4}$ (at $x = 1$).

  (b) The global minimum is ≈ -0.385 (at $x \approx 1.577$) and the global maximum is 6 (at $x = 3$).

  (c) The global minimum is -1 (at $x = 1$) and the global maximum is 11 (at $x = 3$).