MATH 142–511, 516, 517 Spring 2010

Answers to the sample problems for Test 2

1. (a) The exact cost of producing the 31st umbrella is \$2. $C'(31) = 2$.

   (b) The marginal revenue $R'(x) = 25 - 0.02x$, the marginal average revenue $\bar{R}'(x) = -0.01$.

   (c) The average profit per umbrella if 20 umbrellas is produced is $\bar{P}(20) = -427.2$. The marginal average profit at a production level of 20 umbrellas is $\bar{P}'(20) = 22.49$. The average profit per umbrella if 21 umbrella is produced is $\bar{P}(20) + \bar{P}'(20) = -404.71$.

2. (a) \$15143.71

   (b) 14 years

3. \$15163.27

4. 8.66%

5. 71 years

6. $y = 3x - 3 + \ln 2$.

7. $x = 2$

8. (a) $\dfrac{1}{4}\dfrac{12x^2+5}{(4x^3+5x+7)\ln 3}$.

   (b) $-6x^2\, 8^{1-2x^3} \ln 8$

   (c) $\dfrac{6x(5-2x^2)}{(x^2+5)^4}$

   (d) $(2x^2+4x-5)e^{2x+3}$

9. (a) $E(p) = \dfrac{p}{60-p}$.

   (b) $30 < p < 60$

   (c) the demand will increase by 1%

   (d) the revenue will increase

10. (a) $f''(x) = x(2x^3-5)^4 + 144x^3(2x^3-5)^3 + 432x^6(2x^3-5)^2$

    (b) $f''(x) = \dfrac{4}{x^3} - \dfrac{72}{x^5}$

11. (a) $(b, c) \cup (f, \infty)$

    (b) $(a, b) \cup (c, f)$

    (c) b, f

    (d) $(a, c) \cup (c, d) \cup (e, g)$

    (e) $(d, e) \cup (g, \infty)$

(f) d, e, g

12. (a) $x = \sqrt[3]{4} \approx 1.59$
    (b) f is increasing on $(1.59, \infty)$, f is decreasing on $(-\infty, 1.59)$
    (c) f has a local minimum at $(1.59, -4.76)$
    (d) f is concave upward on $(-\infty, \infty)$
    (e) there are no inflection points.
13. The absolute maximum value for f is 3; the absolute minimum value for f is $\sqrt{5} \approx 2.236$.
14. The absolute minimum value for f is -1; no absolute maximum.
15. 40cm $\times$ 40cm $\times$ 20cm