King Fahd University of Petroleum and Minerals
Department of Mathematics

Math 106
Major Exam II
211
15 November, 2021

EXAM COVER

Number of versions: 4
Number of questions: 15
Number of Answers: 5

This exam was prepared using EXAM SHUFFLER For questions send an email to Dr. Mohammed Alshahrani (mshahrani@kfupm.edu.sa)

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Net Time Allowed: 90 Minutes

MASTER VERSION

1. Consider $f(x) = \frac{1}{3}x^3 - 8x^2$ on the interval $[0, 3]$. Then $f(x)$ has absolute minimum at $x =$

(a) 3 (correct)

(b) 0

(c) 8

(d) 16

(e) -8

2. Consider the function y, where $y' = \dfrac{x^2(x-2)}{x-1}$. The graph of y has

(a) a local minimum at $x = 2$ and no local maximum (correct)

(b) a local minimum at $x = 2$ and a local maximum at $x = 0$

(c) a local maximum at $x = 2$ and no local minimum

(d) a local maximum at $x = 2$ and a local minimum at $x = 0$

(e) a local minimum at $x = 0$ and no local maximum

3. Vertical asymptote(s) of the graph of $y = \dfrac{x^2 - 1}{x^2 - x}$ is/are

(a) $x = 0$ (correct)

(b) $x = 1$

(c) $x = -1$

(d) $x = 0$ and $x = -1$

(e) $x = -2$

4. The graph of $f(x) = \dfrac{x^2 - 3x}{x^2 - 4x + 3}$ has

(a) one vertical asymptote and one horizontal asymptote (correct)

(b) two vertical asymptotes and one horizontal asymptote

(c) two vertical asymptotes

(d) one vertical asymptote and three horizontal asymptotes

(e) two vertical asymptotes and one oblique asymptote

5. Let $f(x) = \dfrac{2}{2x-3}$ then

(a) $f(x)$ has no inflection point (correct)

(b) $f(x)$ has inflection point at $x = 2/3$

(c) $f(x)$ has inflection point at $x = 3/2$

(d) $f(x)$ has horizontal asymptote at $x = 3/2$

(e) $f(x)$ has vertical asymptote at $x = 2/3$

6. Given the demand function $p = 500 - 5q$, then the marginal revenue is

(a) decreasing only for $q > 0$ (correct)

(b) increasing only for $q > 50$

(c) increasing only for $q < 50$

(d) decreasing only for $q > 50$

(e) increasing only for $q > 0$

7. A manufacturer finds that the total cost c, of producing a product is given by the cost function $c = 0.01q^2 + 11q + 100$. The average cost per unit will be a minimum if the number of units produced are

(a) 100 (correct)

(b) 10

(c) 300

(d) 1100

(e) 200

8. The function $y = \dfrac{x^4}{3} - \dfrac{x^2}{2} - 6$ is

(a) concave up on $\left(-\infty, -\dfrac{1}{2}\right)$ and $\left(\dfrac{1}{2}, \infty\right)$ (correct)

(b) concave up on $\left(-\dfrac{1}{2}, \infty\right)$

(c) concave down on $\left(-\infty, -\dfrac{1}{2}\right)$

(d) concave down on $\left(-\infty, -\dfrac{1}{2}\right)$ and $\left(\dfrac{1}{2}, \infty\right)$

(e) concave up on $\left(-\dfrac{1}{2}, \dfrac{1}{2}\right)$

9. Let $y''(x) = 9x^2 + 2e^x$, $y'(0) = 2$ and $y(0) = 9$. Then $y(-1)$ is equal to

(a) $\dfrac{31}{4} + \dfrac{2}{e}$ (correct)

(b) $\dfrac{25}{4} + \dfrac{2}{e}$

(c) $\dfrac{31}{4} - \dfrac{2}{e}$

(d) $\dfrac{25}{4} + e^2$

(e) $-3 + e$

10. Suppose that the demand equation for a product is $2 + \dfrac{q^2}{200} = \dfrac{4000}{p^2}$. Using differentials and the fact that $\dfrac{dq}{dp} = -2.5$ when $p = 20$, the approximation of the number of product units that will be demanded if the price per unit is reduced from $p = 20$ into $p = 19.6$ is

(a) 41 (correct)

(b) 42

(c) 38

(d) 35

(e) 40

11. If $y'(x) = \dfrac{3x}{3x^2+6}$ and $y(1) = 0$ then $y(x)$ is equal to

(a) $\ln\sqrt{\dfrac{3x^2+6}{9}}$ (correct)

(b) $\dfrac{1}{3}\ln(3x^2+6)$

(c) $\dfrac{1}{3}\ln(3x^2+6) + C$

(d) $\ln\sqrt{\dfrac{3x^2+6}{3}}$

(e) $-\dfrac{1}{2}(3x^2+6)^{-2} + C$

12. If the marginal-revenue function for a manufacturer's product is $\dfrac{dr}{dq} = 100 - 12q - 5q^4$, then the demand equation is

(a) $p = 100 - 6q - q^4$ (correct)

(b) $p = 100q - 6q^2 - q^5$

(c) $p = 100 - 12q - 5q^4$

(d) $p = 100 + 10q^3$

(e) $p = 10 - 5q^4$

13. $\int (30e^{-30x} + e)\, dx$

(a) $-e^{-30x} + ex + c$ (correct)

(b) $-900e^{-30x} + ex + c$

(c) $-\dfrac{30}{31}\, e^{-31x} + ex + c$

(d) $-900e^{-30x} + e^{x} + c$

(e) $e^{-30x} + e^{x} + c$

14. $\int \dfrac{\sqrt{x}}{e^{\sqrt{x^3}}}\, dx =$

(a) $-\dfrac{2}{3e^{\sqrt{x^3}}} + c$ (correct)

(b) $\dfrac{\sqrt{x}}{e^{\sqrt{x^3}}} + c$

(c) $\dfrac{1}{2e^{\sqrt{x^3}}} + c$

(d) $\dfrac{\sqrt{x^3}}{3e^{\sqrt{x^3}}} + c$

(e) $e^{\sqrt{x^3}} + c$

15. $\int (2e^x + 3x^e + x^{-2})\, dx$

(a) $2e^x + 3\dfrac{x^{e+1}}{e+1} - \dfrac{1}{x} + c$ (correct)

(b) $2e^x + 3x^e + \dfrac{1}{x} + c$

(c) $2e^x + 3x^e + \dfrac{1}{x^3} + c$

(d) $e^x + 3\dfrac{x^{e+1}}{e+1} - \dfrac{1}{x} + c$

(e) $2e^x + \dfrac{x^{e+1}}{e+1} - \ln|x| + c$