King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics

Math 101
Exam II
Term 121
Thursday 22/11/2012

EXAM COVER

Number of versions: 4
Number of questions: 20
Number of Answers: 5 per question

This exam was prepared using mcqs
For questions send an email to Dr. Ibrahim Al-Lehyani (iallehyani@kaau.edu.sa)

King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics

Math 101
Exam II
Term 121
Thursday 22/11/2012
Net Time Allowed: 120 minutes

MASTER VERSION

1. If $y = x^2 \sin x + 2x \cos x - 2 \sin x$, then $y' =$

   (a) $x^2 \cos x$

   (b) $x^2 \cos x - 4x \sin x - 4x \cos x$

   (c) $(x^2 + x + 1) \cos x$

   (d) $x^2 \sin x$

   (e) $x^2 \cos x - 4 \cos x$

2. The accompanying figure shows the graph of $y = f(x)$. Then the graph of $y = f'(x)$ lies below the x-axis on the interval(s)

   (a) $(-\infty, -1)$ and $(0, 1)$

   (b) $(-2, 2)$

   (c) $(-1, 0)$ and $(1, \infty)$

   (d) $(-1, 1)$

   (e) $(-\infty, -2)$ and $(2, \infty)$

3. If $-1 < x < 0$, then $\dfrac{d}{dx}\cos^{-1}\sqrt{1-x^2} =$

(a) $\dfrac{-1}{\sqrt{1-x^2}}$

(b) $\dfrac{-2x}{\sqrt{1-x^2}}$

(c) $\dfrac{2}{\sqrt{1-x^2}}$

(d) $\dfrac{1}{x\sqrt{1-x^2}}$

(e) $\dfrac{-1}{x\sqrt{1-x^2}}$

4. Let x and y be differentiable functions of t.
If $x^2y^3 = 8/27$ and $\dfrac{dy}{dt} = 1/2$, then $\dfrac{dx}{dt}$ when $x = 1$ is equal to

(a) $-\dfrac{9}{8}$

(b) $\dfrac{4}{27}$

(c) $-\dfrac{3}{8}$

(d) $-\dfrac{2}{27}$

(e) $\dfrac{4}{9}$

5. If $f(x) = \ln(x^2+4)^{-3} - 3x\cot^{-1}\left(\frac{x}{2}\right)$, then $f'(-2) =$

(a) $\dfrac{3\pi}{4}$

(b) $-\dfrac{6}{5} + \dfrac{3\pi}{4}$

(c) $-3 + \dfrac{3\pi}{4}$

(d) $-\dfrac{3\pi}{2}$

(e) $-\dfrac{1}{2} + \dfrac{3\pi}{4}$

6. If $\lim\limits_{h\to 0} \dfrac{f(-4+h) - f(-4)}{h} = 3$, then which one of the following statements is **FALSE**?

(a) $\lim\limits_{x\to -4} f(x)$ does not exist

(b) The function f is continuous at $x = -4$

(c) The rate of change of $f(x)$ with respect to x at $x = -4$ is 3

(d) The function f is differentiable at $x = -4$

(e) The slope of the tangent line to f at $x = -4$ is 3

7. If the function $f(x) = \begin{cases} ax + b, & x > -1 \\ bx^2 - 1, & x \leq -1 \end{cases}$ is differentiable everywhere, then $8a + 6b =$

(a) 5

(b) -2

(c) 9

(d) -1

(e) 11

8. If at time t, the position of a body moving along the s- axis is $s(t) = t^3 - 9t^2 + 24t$, then the total distance traveled by the body from $t = 0$ to $t = 3$ is

(a) 22

(b) 20

(c) 54

(d) 64

(e) 18

9. If $f(x) = x^{4/3}$, then which one of the following statements is **FALSE?**

(a) f is not differentiable at $x = 0$.

(b) $f'(8) = \dfrac{8}{3}$

(c) f has a horizontal tangent at $x = 0$.

(d) f has no vertical tangent at $x = 0$

(e) $\lim\limits_{x \to 0^-} f(x) = 0$

10. If $f(t) = t^2(t^3 - 1)^5$, then $f'(t)=$

(a) $t\,(t^3 - 1)^4\,(17t^3 - 2)$

(b) $2t\,(t^3 - 1)^4\,(15t^3 - 4)$

(c) $t\,(t^3 - 1)^4\,(17t^3 - 3)$

(d) $15\,(t^3 - 1)^4\,(17t^3 - 2)$

(e) $t\,(t^3 - 1)^5\,(17t^3 - 1)$

11. The rate of change of $s(t) = \left(e^{\tan 2t}\right)^3$ with respect to t at $t = \dfrac{\pi}{8}$ is

(a) $12\,e^3$

(b) $18\,e^2$

(c) $6\,e^3$

(d) $6\,e^2$

(e) $3\,e^3$

12. A table of values of f, g, f' and g' is given, if $H(x) = e^x g(f(x))$, then $H'(0) =$

(a) 25

(b) 17

(c) 40

(d) 3

(e) 29

13. If $y^3 + 3x = 1 - 3y$, then the product $(y^2 + 1)^3 y''$ is equal to

(a) $-2y$

(b) 1

(c) $-3y$

(d) y

(e) $-y$

14. The sum of all values of x at which the tangent lines to the graph of $y = \dfrac{x-1}{x+1}$ are parallel to the line $9x - 2y + 1 = 0$ is

(a) -2

(b) 1

(c) -3

(d) $-2/3$

(e) $4/3$

15. If $y = \dfrac{2x-1}{3x+1}$, then y''' is equal to

(a) $270\,(3x+1)^{-4}$

(b) $-150\,(3x+1)^{-4}$

(c) $-270\,(3x+1)^{-3}$

(d) $150\,(3x+1)^{-4}$

(e) $-90\,(3x+1)^{-3}$

16. The slope of the tangent line to the graph of $y = \dfrac{(3x^2+1)^{3/2}(5x-1)^{1/2}}{(x^3+7)^{1/3}}$ at $x = 1$, is [Hint: You may use logarithmic differentiation]

(a) 22

(b) 24

(c) 18

(d) 28

(e) 30

17. When sketching the graph of $f(x) = 2 - |3 - x|$ we find that only one of the following statments is **TRUE**

(a) The left-hand derivative of f at 3 is 1

(b) The right-hand derivative of f at 5 is 0

(c) The left-hand derivative of f at 0 is -1

(d) $f'(3) = \pm 1$

(e) $f'(0) = f'(5)$

18. A hot air balloon rising straight up from a level field is tracked by a boy 300 ft on the ground from the lifting point. If the balloon is rising at the constant rate of 150 ft/min, then the rate of change of the boy's elevation angle θ when $\theta = \dfrac{\pi}{4}$ is

(a) 0.25 rad/min

(b) 0.125 rad/min

(c) 0.025 rad/min

(d) 0.0125 rad/min

(e) 0.075 rad/min

19. If $y = x^{x-\ln x}$, then $\dfrac{xy'}{y}$ is equal to

(a) $x - 2\ln x + x\ln x$

(b) $x - \ln x + 2x\ln x$

(c) $2x - \ln x + x\ln x$

(d) $x + 2\ln x - 2x\ln x$

(e) $-2x + \ln x - x\ln x$

20. The slope of the normal line to the curve $2x^2\sin^2 y + 3\sqrt{2}\cos y = 4$ at the point $\left(1, \dfrac{\pi}{4}\right)$ is

(a) $-1/2$

(b) $2/3$

(c) $-1/3$

(d) $3/2$

(e) $-1/4$