King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences
Math 102
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Second Major Exam
Semester I, 2001–2002 (011)

Name: ——————————————— ID #: ———————————————

Section #: 7 (9:00 – 9:50), 11 (10:00 – 10:5) (please circle one)

Serial #: ———————————

Problem #		Points
1		16
2		16
3		16
4		16
5		16
6		16
7		25
8		25
9		25
10		29
Total:		200

FORM(B)

1. If $g(x) = \sqrt{x}f(x)$, $f(1) = 8$ and $f'(1) = 9$ then $g'(1) =$

   (a) 5

   (b) 4

   (c) 9

   (d) 13

   (e) 40

2. Let $y = \exp(\sqrt{1 + 5x^3})$ then $y''(0) + y'(0) =$

   (a) e

   (b) 0

   (c) $-e$

   (d) $2e$

   (e) $-2e$

3. Let $f(x) = 5x - \sin 2x$ and $g(x) = f^{-1}(x)$ then $g'(\frac{\pi}{2}) =$

(a) $\dfrac{1}{7}$

(b) $\dfrac{1}{5}$

(c) 3

(d) $\dfrac{1}{3}$

(e) 5

4. When a spherical ball of metal is heated, the radius of the sphere increases by 0.2% per degree increase in temperature. Use differential to estimate the percentage increase in the volume of the ball per degree increase in temperature. $(V = \frac{4}{3}\pi r^3)$ The estimate is:

(a) 1.2%

(b) 0.3%

(c) 0.6%

(d) 2.4%

(e) 0.1%

5. The slope of the tangent line to the curve $y = \sin^{-1}(\frac{1}{2}\tan x) + \tan^{-1}(1+\ln(x+1))$ at the point $x = 0$ equals

   (a) $\dfrac{3}{2}$

   (b) $\dfrac{1}{2}$

   (c) 0

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

   (e) 1

6. Use a differential to approximate $(1.984)^4$

   (a) 15.4880

   (b) 15.5567

   (c) 15.5520

   (d) 15.4880

   (e) 15.3600

7. Let $x \cos y = y - \dfrac{\pi}{2}$. Find $y''(0)$.

8. Find $\lim_{h->0} (1 - 3h)^{\frac{2}{h}}$

9. Let $h(x) = \dfrac{f(g(x))}{g(x)}$. Find $h''(2)$. Given that:

$$f(2) = 2, \quad f'(2) = f''(2) = -1$$
$$g(2) = 2, \quad g'(2) = g''(2) = -1$$

10. Let $F(x) = f(2g(x))$ where $f(x) = x^4 + x^3 + 1$ for $0 \le x \le 2$ and $g(x) = f^{-1}(x)$. Find $F''(3)$.