

King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences
Math 102
Dr. Faisal Fairag
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(A)

1. If $g(x) = \sqrt{x}f(x)$, $f(1) = 8$ and $f'(1) = 5$ 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 $g'(\pi) =$

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

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

(c) 3

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

(e) 5

4. When a spherical ball of metal is heated, the radius of the sphere increases by 0.1% 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 $y = \sin^{-1}(\tan x) + \tan^{-1}(1 + \ln(x + 1))$ at the point $x = 0$ equals

- (a) $\frac{3}{2}$
- (b) $\frac{1}{2}$
- (c) 0
- (d) $\frac{2}{3}$
- (e) 1

6. Use a differential to approximate $(1.986)^4$

- (a) 15.4880
- (b) 15.5567
- (c) 15.5520
- (d) 15.4880
- (e) 15.3600

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

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

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

$$\begin{aligned} f(2) &= 2, & f'(2) &= f''(2) = -1 \\ g(2) &= 2, & g'(2) &= g''(2) = -1 \end{aligned}$$

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