

NAME/ID: _____

Section # _____

Important: You should write your solutions in the space given. If you have to write your solution outside the space provided, you must indicate **clearly** where your solutions are. Failing to do so may result in losing credit points as grader will ignore solutions that are not written in the given space.

PART 1. This portion of the test consists of five Fill in the Blank questions. Write your answers neatly and legibly in the spaces provided. Some partial credit may be given.

1. (3 points) Given $f(x) = x^3 - 2x + \sqrt{2}$, $f'''(x)$ equals _____.
2. (6 points) If $\lim_{h \rightarrow 0} \frac{\sin(\frac{\pi}{2} + h) - 1}{h}$ represents $f'(a)$ for some function f at a point a , then $f(x) =$ _____ and $a =$ _____.
3. (3 points) The derivative of $f(x) = \frac{2}{x-1}$ is _____.
4. (3 points) The derivative of $f(x) = \sin^2(x)$ is _____.
5. (3 points) The derivative of $f(t) = \tan(6t)$ is _____.
6. (3 points) The slope of tangent line to the curve $y = f(x) = \sqrt{2x+2}$ at $x = 1$ is _____.
7. (6 points) The position function of a moving particle is $s = f(t) = t^3 + 2t$, its velocity at $t = 2$ is _____ and its acceleration at $t = 2$ is _____.

PART 2: This portion of the test consists of two multiple choice problems. No partial credit is given in this section, so work very carefully. *Value: 3 points each*

8. The curve $y = x(x^2 - 3)$ has horizontal tangent lines when x takes these values:

- (A) 0 (B) $0, \sqrt{3}$ (C) $0, \sqrt{3}, -\sqrt{3}$
(D) 0, 3 (E) 1, -1 (F) None of These.

9. The derivative of $f(x) = \frac{x^3}{5x+1}$ is:

- (A) $\frac{3x^2}{5}$ (B) $\frac{3x^2 + 5}{(5x+1)^2}$ (C) $\frac{3x^2(5x+1) + 5x^3}{(5x+1)^2}$
 (D) $\frac{3x^2(5x+1) - 5x^3}{5x+1}$ (E) $\frac{3x^2(5x+1) - 5x^3}{(5x+1)^2}$ (F) None of these.

10. If $f(x) = \frac{x^2 - 1}{x}$ Then $f''(x)$ equals

- (A) 2 (B) $\frac{2}{x^3}$ (C) -2
(D) $\frac{2x+2}{x^3}$ (E) $-\frac{2}{x^3}$ (F) None of these.

11. Suppose that $f(3) = -1, g(3) = 2, f'(3) = 2$ and $g'(3) = -1$. Then $(fg)'(3)$ is

- (A) 9 (B) 5 (C) 3
(D) 1 (E) 7 (F) None of These.

12. The derivative of $f(x) = (x^2 + 2) \sin(x)$ is

- (A) $2x \cos(x)$ (B) $2x(-\cos(x))$ (C) $2x \cos(x) + (x^2 + 2) \sin(x)$
(D) $2x \sin(x) - (x^2 + 2) \cos(x)$ (E) $2x \sin(x) + (x^2 + 2) \cos(x)$ (F) None of These.

13. The slope of the line tangent to the curve $x^2 + y^3 = 5$ at the point $(2, 1)$ is

- (A) $\frac{-3}{4}$ (B) $\frac{-4}{3}$ (C) $\frac{3}{4}$
(D) $\frac{4}{3}$ (E) $\frac{6}{23}$ (F) None of These.

14. The derivative of $f(x) = \sin(\cos(x))$ is

- (A) $\cos(\cos(x))$ (B) $\cos(\sin(x))$ (C) $\cos(\sin(x)) + \sin(\cos(x))$ (D) $\cos^2(x) - \sin^2(x)$
(E) $\cos(\cos(x))\sin(x)$ (F) $\sin(\sin(x))\cos(x)$ (G) $\sin(\cos(x))\sin(x)$ (H) None of These.

PART 3: This portion of the exam will be graded on a partial credit basis. **Answers without supporting work shown on the paper will receive NO credit.**

15. (4 points each) Find the derivative of each of the functions, do not simplify your solutions.

(a) $f(x) = \left(\frac{1 + 4x^2}{2 + 5x}\right)^4$.

(b) $f(x) = x^2 \sin(\sqrt{x^2 + 3})$.

(c) $f(x) = \frac{\cos(x)}{x} + \sec(4x)$.

16. (10 points) Find the derivative of $f(x) = x^2 + x$ by using the definition of the derivative. (No credit for not using the definition of the derivative).

17. (10 points) Find an equation of the tangent line to the curve $y = f(x) = x^4 - x$ parallel to the line $y = 3x + 1$.

18. (10 points) Given $x^5 + x^3y^2 = 1 + xy^4$, find dy/dx .

19. (10 points) Let $f(x)$ be a positive valued differentiable function, and let $g(x) = x\sqrt{9 + 2f(x)}$.
If $f(1) = 8$ and $f'(1) = 5$, find $g'(1)$.

Math 155 Exam Grade Sheet

Question	Grade	
1 – 7	_____	(out of 27)
8 – 14	_____	(out of 21)
15	_____	(out of 12)
16	_____	(out of 10)
17	_____	(out of 10)
18	_____	(out of 10)
19	_____	(out of 10)
TOTAL	_____	(out of 100)