

Math 131, Fall 2008 - Exam 2

NAME:

STUDENT ID NUMBER:

This exam contains fourteen questions. The first twelve are multiple choice questions and count for five points each. There is no partial credit on these questions, so **read each question carefully**, check your arithmetic and make sure that you have marked the answer you intended to mark. The last two questions, which are each worth twenty points, require written answers, and some partial credit might be given. However, no credit will be given for information that is not germane to the problem at hand. Please make sure to write your name and student ID number on the pages that include your answers to the last two questions. Also, put your section number on the first page of each of the last two questions. In fact, **you will get one point on each of these two questions for writing your name, ID number and section number legibly.**

1. Say $f(x) = x^3 + 2x$. What is $f'(1)$?

- (a) 1.
- (b) 2.
- (c) 3.
- (d) 4.
- (e) 5.
- (f) 6.
- (g) 7.
- (h) 8.

2. Say $f(x) = x^2 \sin x$. What is $f'(x)$?

(a) $2x \cos x$.

(b) $2x + \cos x$.

(c) $2x \sin x + x^2 \cos x$.

(d) $2x - \cos x$

(e) $x^2 \sin x + 2x \cos x$.

(f) $-2x \sin x + x^2 \cos x$.

(g) $2x \sin x - x^2 \cos x$.

(h) $x^2 \sin x$.

3. Say $f(x) = x^4 + x^3 + x^2 + x + 1$. What is $f'''(x)$? (Look carefully. How many “primes” do you see?)

(a) $4x^3 + 3x^2 + 2x + 1$.

(b) $12x^2 + 6x + 2$.

(c) $24x + 6$.

(d) 0.

(e) $x^3 + x^2 + x + 1$.

(f) $x^2 + x + 1$.

(g) $x + 1$.

(h) 1.

4. Say $f(x) = \frac{x^2+1}{3x-2}$. What is $f'(x)$?

(a) $\frac{2x}{3}$.

(b) $\frac{2x}{9}$.

(c) $\frac{x^2+1}{(3x-2)^2}$.

(d) $\frac{3x^2-4x-3}{(3x-2)^2}$.

(e) $3(x^2 + 1) + 2x(3x - 2)$.

(f) $\frac{x^4+2x^2+1}{9x^2-12x+4}$.

(g) $\frac{2x}{(3x-2)^2}$.

(h) $2x - 3$.

5. If $f(x) = e^{x^2+x}$, what is $f'(x)$?

(a) $(2x + 1)e^{x^2+x}$.

(b) e^{x^2+x} .

(c) $2xe^{x+2} + e^x$.

(d) $(x^2 + x)e^{2x+1}$.

(e) e^{2x+1} .

(f) $e^{x^2} + e^x$.

(g) $e^{2x} + e$.

(h) e^{2x} .

6. Say $f(x) = \sin(e^x)$. What is $f'(x)$?

(a) $\cos(e^x)$.

(b) $e^{\cos x}$.

(c) $x \sin(e^x)$.

(d) $e^x \sin(e^x)$.

(e) $e^x \cos(e^x)$.

(f) $\sin(e^x)$.

(g) $e^{\sin x}$.

(h) $x \cos(e^x)$.

7. Say $f(x) = x^e + e^x$. What is $f'(x)$?

(a) $x^e + e^x$.

(b) $x^{e-1} + e^{x-1}$.

(c) $x^e + e^{x-1}$.

(d) $x^{e-1} + e^x$.

(e) $x^e + xe^x$.

(f) $x^{e-1} + xe^x$.

(g) $ex^{e-1} + e^x$.

(h) $ex^{e-1} + xe^x$.

8. If $f(x) = \log_3 x$, what is $f'(x)$?

- (a) $\frac{1}{3x}$.
- (b) $\frac{3}{x}$.
- (c) $\frac{1}{x \ln 3}$.
- (d) $x \ln 3$.
- (e) $3 \ln x$.
- (f) $\frac{1}{\log_3 x}$.
- (g) $3 \log_3 x$.
- (h) $\frac{\log_3 x}{3}$.

9. Say $f(x) = x^2 + 5x + 2$, with domain $[-2.5, \infty)$. What is $(f^{-1})'(-2)$?

- (a) -4 .
- (b) -3 .
- (c) -2 .
- (d) -1 .
- (e) 0 .
- (f) 1 .
- (g) 2 .
- (h) 3 .

10. Say f is a continuous function and

$$\lim_{x \rightarrow 4} \frac{f(x) + 5}{x - 4} = 2.$$

Fill in both blanks so that the following statement is true no matter what else we know about f : The equation of the tangent line to the graph of f at the point (blank 1) is (blank 2).

- (a) $(4, 5)$, $y = 2x - 3$.
- (b) $(5, 4)$, $y = 2x - 2$.
- (c) $(2, 4)$, $y = 5x - 6$.
- (d) $(2, -5)$, $y = 4x - 13$.
- (e) $(-5, 2)$, $y = -4x - 18$.
- (f) $(5, 2)$, $y = 4x - 18$.
- (g) $(4, 2)$, $y = 5x - 18$.
- (h) $(4, -5)$, $y = 2x - 13$.

11. If the position at time t seconds of a particle moving along a line is $t^3 + 2t$ feet from its original position, what is the velocity, in feet per second, of the particle at time 3 seconds?

- (a) 3.
- (b) 9.
- (c) 15.
- (d) 33.
- (e) 29.
- (f) 0.
- (g) 24.
- (h) -10 .

12. I throw a ball into the air. While in the air its height, in feet, after t seconds is $24t - 16t^2$. What is the velocity (in feet per second) of the ball when it is eight feet off the ground *on the way down*?

- (a) -24 .
- (b) -16 .
- (c) -8 .
- (d) 0 .
- (e) 4 .
- (f) 8 .
- (g) 16 .
- (h) 24 .

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13. State the precise definition of the derivative of a function f at a point a in the domain of f . Use this definition to find the derivative of $f(x) = x^3$ at $x = 3$. (You must use the definition of the derivative. No points will be awarded for using derivative rules such as the power rule.)

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14. What is the equation of the tangent line to the curve $x^5 - xy + y^5 = 1$ at the point $(1, 1)$?

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