Multiple Choice

1.(6 pts.) Suppose that $f(2) = 3$, $f(3) = 2$, $g(2) = 3$ and $g(3) = 1$.
What is $(f \circ g)(2)$?

(a) 3 (b) 6 (c) 1 (d) 2 (e) 9

2.(6 pts.) Calculate

$$\lim_{x \to 2} \frac{x^2 - 4}{x^2 - 5x + 6}.$$

(a) -4 (b) 1 (c) $-\infty$ (d) -1 (e) it does not exist

3.(6 pts.) Calculate

$$\lim_{x \to 0^-} \frac{|x| \cos(x)}{x}.$$

(a) $-\infty$ (b) 1 (c) -1 (d) ∞ (e) does not exist

4.(6 pts.) What is the equation of the tangent line to $y = \frac{1}{x^2}$ at the point $(2, \frac{1}{4})$?

(a) $y = \frac{-1}{4}x + \frac{-1}{4}$ (b) $y = \frac{1}{4}x + \frac{3}{4}$ (c) $y = \frac{1}{4}x + \frac{-1}{4}$

(d) $y = 1 - x$ (e) $y = \frac{-1}{4}x + \frac{3}{4}$

5.(6 pts.) Which of the following functions has

$$f'(1) = \lim_{h \to 0} \frac{1}{h} \left(\frac{1+h}{2+h} - \frac{1}{2} \right)?$$

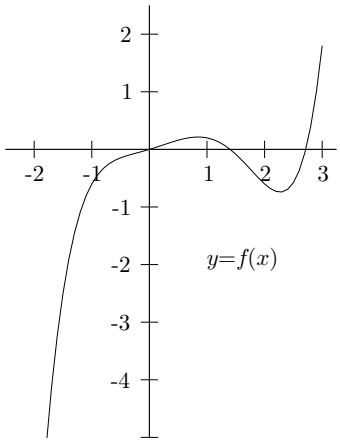
(a) $\frac{1+x}{x(2+x)}$ (b) $\frac{x}{1+x}$ (c) $\frac{1}{x}$ (d) $\frac{1+3x}{2+x}$ (e) none of the above

6.(6 pts.) What is the derivative of $y = x[\![x]\!]$ at $x = 0$?
(Recall that $[\![x]\!]$ denotes the greatest integer $\leq x$.)

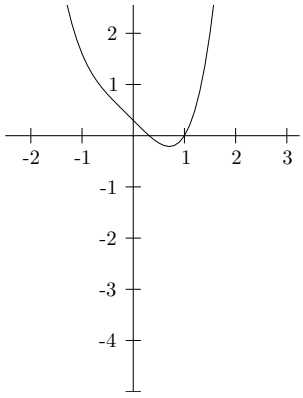
(a) 2 (b) 0 (c) -1 (d) 1

(e) it does not exist, the function is not differentiable at $x = 0$

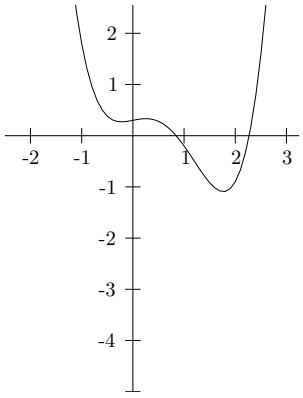
7.(6 pts.) Which of the following is a reasonable graph of f' given the graph of the function f below?



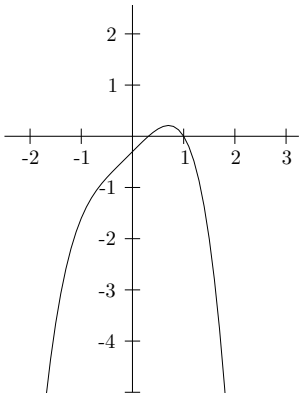
(a)



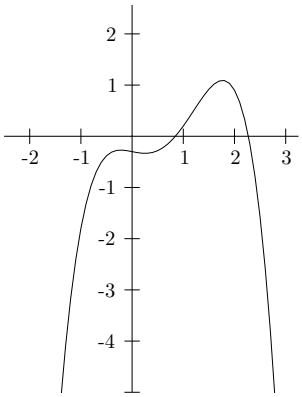
(b)



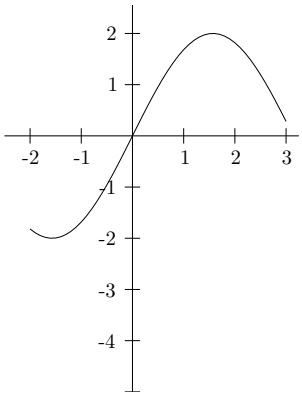
(c)



(d)



(e)



8.(6 pts.) If $f(2) = 3$, $f'(2) = 2$, $g(2) = 4$, $g'(2) = 5$ and $h(x) = f(x)g(x)$, what is $h'(2)$?

(a) 7 (b) 10 (c) 26 (d) 23

(e) cannot be determined from the given data

9.(6 pts.) Let

$$f(x) = \frac{\sin(x) + \cos(x)}{\cos^2(x)} \ .$$

What is $f'(0)$?

(a) 0 (b) -1 (c) 1 (d) ∞ (e) 2

10.(6 pts.) Find $\lim_{t \to 0} \frac{\sin(5t)}{t}$.

(a) 5 (b) $\frac{1}{5}$ (c) $\frac{1}{25}$ (d) 1 (e) 25

Partial Credit

11.(10 pts.) Using the limit definition of the derivative, find $f'(1)$ when $f(x) = \sqrt{x}$.

12.(10 pts.) A particle moves according to $s = 90t^{1/2} - 25t^{3/2} + 3t^{5/2}$ where $t \geq 0$ is measured in seconds and s in feet.
(a) Find the velocity at time $t = 1$.
(b) At which time is the velocity of the particle zero?
(c) Find the distance covered between times $t = 0$ and $t = 1$.

13.(10 pts.) Define

$$f(x) = \begin{cases} x & x \leq 1 \\ x^3 + cx & x > 1 \end{cases}$$

where c is a constant.

For which value(s) of c is the function f continuous for all real numbers?

14.(10 pts.) Let $f(x) = x^2 + 1$. For which values of a does the tangent line to $y = f(x)$ at the point $(a, f(a))$ intercept the y-axis at $(0, -3)$?

Name: ANSWERS

Instructor: ANSWERS

Exam I
September 25, 2001

- The Honor Code is in effect for this examination. All work is to be your own.
- No calculators.
- The exam lasts for one hour.
- Be sure that your name is on every page in case pages become detached.
- Be sure that you have all 11 pages of the test.

Good Luck!

PLEASE MARK YOUR ANSWERS WITH AN X, not a circle!

1.	(a)	(b)	(c)	(•)	(e)
2.	(•)	(b)	(c)	(d)	(e)
3.	(a)	(b)	(•)	(d)	(e)
4.	(a)	(b)	(c)	(d)	(•)
5.	(a)	(•)	(c)	(d)	(e)
6.	(a)	(b)	(c)	(d)	(•)
7.	(a)	(•)	(c)	(d)	(e)
8.	(a)	(b)	(c)	(•)	(e)
9.	(a)	(b)	(•)	(d)	(e)
10.	(•)	(b)	(c)	(d)	(e)

DO NOT WRITE IN THIS BOX!

Total multiple choice: _____

11. _____

12. _____

13. _____

14. _____

Total: _____