1. What is

$$\lim_{x \to 2} 3x + 1?$$

(a) 1

(b) 2

(c) 3

(d) 4

(e) 5

(f) 6

(g) 7

(h) the limit does not exist.

2. What is the natural domain for $f(x) = \sqrt{2x-1}$?

(a) $[2, \infty)$
(b) $(2, \infty)$
(c) $(0, \infty)$
(d) $[0, \infty)$
(e) $(\frac{1}{2}, \infty)$
(f) $[\frac{1}{2}, \infty)$
(g) $(-\infty, 0)$
(h) $(-\infty, 0]$

3. Say $f(x) = \frac{1}{x}$ and $g(x) = x^2 - 3$. Which of the following is true?

(a) $f \circ g(x) = \frac{1}{x-3}$ and $g \circ f(x) = \frac{1}{x-3}$.

(b) $f \circ g(x) = \frac{1}{x^2-3}$ and $g \circ f(x) = \frac{1}{x^2} - 3$.

(c) $f \circ g(x) = x^2 - 3$ and $g \circ f(x) = \frac{1}{x}$.

(d) $f \circ g(x) = \frac{1}{x^2} - 3$ and $g \circ f(x) = \frac{1}{x^2-3}$.

(e) $f \circ g(x) = g \circ f(x) = \frac{1}{x^2-3}$.

(f) $f \circ g(x) = g \circ f(x) = \frac{1}{x^2} - 3$.

(g) $f \circ g(x) = x$ and $g \circ f(x) = (x^2 - 3)^2 - 3$.

(h) $f \circ g(x) = g \circ f(x) = \frac{1}{x} + x^2 - 3$.

4. Say $f(x) = \frac{1}{x}$ and $g(x) = \frac{x-2}{x^2-1}$. Which are the only real numbers *not* in the natural domain of $f \circ g$?

(a) $0, 1, -1$.

(b) $1, -1$.

(c) $1, 2, -1$.

(d) 0.

(e) $0, 2$.

(f) 2.

(g) $0, 1, 2, -1$.

(h) All real numbers are in the domain.

5. What is

$$\lim_{x \to 1} \frac{x^2 - 1}{x - 1}?$$

(a) -2

(b) -1

(c) 0

(d) 1

(e) 2

(f) 3

(g) 4

(h) The limit does not exist.

6. Say $f(x) = x^2$. What is

$$\lim_{h \to 0} \frac{f(2+h) - f(2)}{h}?$$

(a) 4
(b) $2x$
(c) $2h$
(d) 2
(e) 1
(f) x^2
(g) h^2
(h) The limit does not exist.

7. Which of the following functions has a limit as x approaches 2?

$$f(x) = \begin{cases} -1 & x < 2 \\ 1 & x \geq 2 \end{cases}$$

$$g(x) = \begin{cases} \frac{x^2-4}{x-2} & x \neq 2 \\ 5 & x = 2 \end{cases}$$

$$h(x) = \frac{x^2 - 4}{x + 2}.$$

(a) All of f, g, h have a limit.

(b) f and g have a limit, but h does not.

(c) f and h have a limit, but g does not.

(d) g and h have a limit, but f does not.

(e) f has a limit, but g and h do not.

(f) g has a limit, but f and h do not.

(g) h has a limit, but f and g do not.

(h) None of f, g, h has a limit.

8. Which of the following functions is continuous at 2?

$$f(x) = \begin{cases} -1 & x < 2 \\ 1 & x \geq 2 \end{cases}$$

$$g(x) = \begin{cases} \frac{x^2-4}{x-2} & x \neq 2 \\ 5 & x = 2 \end{cases}$$

$$h(x) = \frac{x^2-4}{x+2}.$$

(a) All of f, g, h are continuous at 2.

(b) f and g are continuous at 2, but h is not.

(c) f and h are continuous at 2, but g is not.

(d) g and h are continuous at 2, but f is not.

(e) f is continuous at 2, but g and h are not.

(f) g is continuous at 2, but f and h are not.

(g) h is continuous at 2, but f and g are not.

(h) None of f, g, h is continuous at 2.

9. What are all real numbers c such that the function

$$f(x) = \begin{cases} \frac{1}{x+c} & x < 0 \\ c(x+1) & x \geq 0 \end{cases}$$

is continuous at 0?

(a) $1, -1$
(b) 1
(c) -1
(d) $0, 1, -1$
(e) $0, 1$
(f) $0, -1$
(g) 0
(h) There are no such numbers.

10. What is

$$\lim_{x\to\infty} \frac{2x^2-5}{3x^2+10000}?$$

(a) 1

(b) $\frac{2}{3}$

(c) $\frac{3}{2}$

(d) $\frac{-5}{10000}$

(e) $\frac{-9}{10003}$

(f) $\frac{7}{10003}$

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

(h) the limit does not exist.

11. Say f is a function whose domain is the set of all real numbers. If $g(x) = f(x+3)$ then the graph of g is obtained from that of f by

(a) shifting three units up.

(b) shifting three units down.

(c) shfiting three units to the left.

(d) shifting three units to the right.

(e) stretching along the y axis by a factor of three.

(f) shrinking along the y axis by a factor of three.

(g) stretching along the x axis by a factor of three.

(h) shrinking along the x axis by a factor of three.

12. Fill in all four blanks in the following paragraph:

The slope of the tangent line to the graph of $f(x) = x^2$ at the point $(1, 1)$ is the limit as x approaches (FIRST BLANK) of the function (SECOND BLANK). The value of this limit is (THIRD BLANK), so the equation of the tangent line is (FOURTH BLANK).

(a) $0, x^2, 0, y = 1$

(b) $1, \frac{(x-1)^2-1}{x}, 2, y = 2x$

(c) $1, \frac{x^2-1}{x-1}, 2, y = 2x - 1$

(d) $1, \frac{x^2}{x}, 1, y = x$

(e) $0, \frac{x^2}{x}, 0, y = 0$

(f) I don't know the answer because I wasn't in class when Professor Shareshian pretty much said that there would be a problem like this on the test.

(g) I don't know the answer because I got my friend who already took this class to do the hard webwork problems for me.

(h) I don't know the answer, but I would like to inject at this juncture that Professor Shareshian is an absolutely outstanding teacher whose salary should be doubled immediately.