Review for Test #1

1. Where is $\ln(3x+1)$ discontinuous?

2. Find the following limits:

a. $\lim_{x\to -3} \frac{1}{x+3}$ b. $\lim_{x\to \frac{\pi}{2}^+} \sec(x)$ c. $\lim_{x\to 3} \frac{(1/x)-(1/3)}{x-3}$ d. $\lim_{x\to 0} \frac{\cos x - 1}{x}$

3. Find the value of the limit $\lim_{x\to 1} (x^{17} - x + 3)$.

A) -4 B) 3 C) -2 D) 1
E) -8 F) 2 G) 0 H) -16

4. Find the value of the limit $\lim_{x\to 4} \frac{x-4}{\sqrt{x}-2}$.

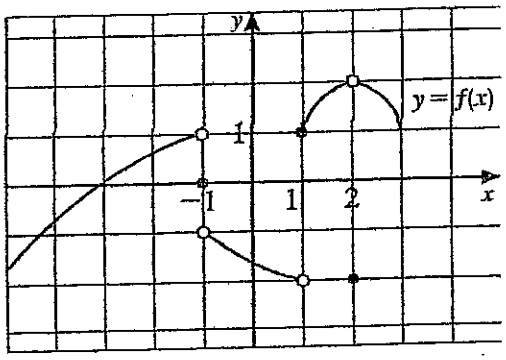
A) 0 B) 2 C) 4 D) 8
E) $\frac{1}{4}$ F) $\frac{1}{8}$ G) $\frac{1}{32}$ H) $\frac{1}{64}$

5. Find the value of the limit $\lim_{x\to 0} \frac{\sin x}{2x}$.

A) $\frac{1}{3}$ B) 3 C) 0 D) 1
E) $\frac{1}{2}$ F) $\frac{1}{4}$ G) 4 H) 2

6. It can be shown that $0 \le \sin x \le x$ for $0 \le x \le \frac{\pi}{2}$. Use this to prove that $\lim_{x\to 0^+} \sin x = 0$.

7. Use the given graph to find the indicated quantities:



(a) $\lim_{x\to -1^-} f(x)$
(b) $\lim_{x\to -1^+} f(x)$
(c) $\lim_{x\to -1} f(x)$
(d) $\lim_{x\to 1^-} f(x)$
(e) $\lim_{x\to 1^+} f(x)$
(f) $\lim_{x\to 1} f(x)$
(g) $\lim_{x\to 2^-} f(x)$
(h) $\lim_{x\to 2^+} f(x)$
(i) $\lim_{x\to 2} f(x)$
(j) $f(-1)$
(k) $f(0)$
(l) $f(1)$
(m) $f(2)$

8. Find the value of the limit $\lim_{x\to\infty} \dfrac{3x^2+4x+2}{5-x+x^3}$.

A) $-\frac{1}{2}$ B) 1 C) 2 D) $\frac{1}{2}$
E) -1 F) $-\frac{1}{3}$ G) -2 H) 0

9. Find the value of the limit $\lim_{x\to\infty} \dfrac{7+3x}{4-x}$.

A) $\frac{3}{4}$ B) 3 C) 7 D) $-\frac{3}{4}$
E) -3 F) $-\frac{7}{4}$ G) -7 H) $\frac{7}{4}$

10. For $f(x) = \dfrac{x-3}{x^2-9}$, an infinite discontinuity occurs at what value of x?

11. Use the Intermediate Value Theorem to show that there is a root of the equation $x^3 + 2x^2 - 42 = 0$ on the interval $(0, 3)$.

12 Find the constant(s) c for which the function $f(x) = \begin{cases} -3x & \text{if } x \le 1 \\ (x-c)(x+c) & \text{if } x > 1 \end{cases}$ is continuous on $(-\infty, \infty)$.

A) -2 B) -1 C) 0 D) 2

E) $-2, -1$ F) $-2, 2$ G) $-1, 2$ H) Does not exist

13. Given $f(x) = \begin{cases} x^3+2 & \text{if } x \le -1 \\ x^2+x+1 & \text{if } -1 < x < 1 \\ x^4+2 & \text{if } x \ge 1 \end{cases}$ find the following limits. Justify your answers

(a) $\lim_{x \to -1^+} f(x)$

(b) $\lim_{x \to -1^-} f(x)$

(c) $\lim_{x \to -1} f(x)$

(d) $\lim_{x \to 1^+} f(x)$

(e) $\lim_{x \to 1^-} f(x)$

(f) $\lim_{x \to 1} f(x)$

14. Given $f(x) = \begin{cases} x^3+2 & \text{if } x \le -1 \\ x^2+x+1 & \text{if } -1 < x < 1 \\ x^4+1 & \text{if } x \ge 1 \end{cases}$ determine where f is continuous and discontinuous and justify your conclusion.

15. Sketch a graph of a function f that is continuous everywhere except at $x = -2$, where f has

(a) a removable discontinuity.

(b) an infinite discontinuity.

(c) a jump discontinuity.