Math 131 - September 17, 2014

Test Review Problems

1. Solve for x:
   (a) $2^{3x+1} = 5$
   (b) $e^{3x} = 8^{1+x}$
   (c) $\frac{10}{e^{-5x}+2} = 1$
2. Suppose $\cos x < 0$ and $\sin x = 4/5$. $\cot x =$
3. Suppose $1 + \ln(x+1) \leq f(x) \leq 2x + e^x$. Find $\lim_{x\to 0} f(x) =$
4. Use your calculuator to obtain a numerical estimate for the slope of the tangent line to the graph $f(x) = \sqrt{1+\sin x}$ at $x = 0$.
5. Find the limits:
   (a) $\lim_{x\to 2} \frac{\sqrt{x^3+8}}{2x+1} =$
   (b) $\lim_{x\to 1} \frac{1-\sqrt{x}}{1-x} =$
   (c) $\lim_{x\to -2} \sqrt{\frac{x^2+3x+2}{x^2-4}} =$
   (d) $\lim_{x\to 1^-} \frac{1}{|x-1|} + \frac{1}{x-1} =$
   (e) $\lim_{x\to 0^-} \frac{4x+|x|}{x} =$
   (f) $\lim_{t\to 3} \frac{3t^2-27}{t^2-t-6} =$
   (g) $\lim_{x\to 1} \frac{(x^3-x)\sin(x-1)\sin(3(x-1))}{x(x-1)^3} =$
   (h) $\lim_{t\to 0} \frac{\sqrt{t^2+9}-3}{t^2} =$
6. For what value of a is $\lim_{x\to a} \frac{(x+3)(x^2+4x+4)}{x-a} = 1$
7. Let $f(x) = \begin{cases} \frac{\sin(k(x-1))}{x-1} & \text{if } x < 1 \\ 2 + \frac{kx^2+kx-2k}{x-1} & \text{if } x > 1 \end{cases}$ For what values of k will $\lim_{x\to 1} f(x)$ exist?
8. Find a value of a so that the function is continuous: $f(x) = \begin{cases} 3x + a & \text{if } x < 2 \\ ax^2 - 2x + 4 & \text{if } x \geq 2 \end{cases}$
9. Find a value of b so that the function is continuous: $f(x) = \begin{cases} bx + 5 \text{ if } x < 1 \\ x^2 + bx + 2b & \text{if } x \geq 1 \end{cases}$
10. Find the slope of the line tangent to the graph at the given x value. Be sure to do this as a limit of slopes of secant lines.
    (a) $f(x) = 4x^2 - 2x$ at $x = 2$.
    (b) $f(x) = 1/(3x)$ at $x = -3$.
    (c) $f(x) = \sqrt{x+1}$ at $x = 3$.

11. Let $f(x) = x^2 - 5x$. Find the slope of the secant between $x = -1$ and $x = 1$.

12. Find the domain:

    (a) $f(x) = \sqrt{9 - (x+1)^2}$

    (b) $f(x) = \sqrt{1 - (x+1)^2/9}$

    (c) $g(x) = \sqrt{18 - 2x}$

13. Let $f(x) = 2/(x+1)$, $g(x) = \sqrt{x+2}$ and $h(x) = x + 3$. Find $g \circ h \circ f(1) =$

14. Let $f(x) = x^2$, $g(x) = \sqrt{1 + \ln x}$ and $h(x) = e^{4x}$. Find $f \circ g \circ h(1)$.

15. Let $f(x) = x/(x-1)$ and $g(x) = ax$ for some constant a. Find the value a so that $f \circ g(4) = 2$.

16. Let $f(x) = x^3 + 4$. Find $f^{-1}(12)$.

17. Let $f(x) = x^4 + 4$. Find $f^{-1}(5)$.

18. Find $\log_2 40 - \log_2 5 =$

19. Let $f(x) = x/(x+1)$ and $g(x) = x + a$ for some a. For what value of a does the graph of $f \circ g$ have an x-intercept at $x = 9$?

20. Find the inverse of the function

    (a) $g(x) = (x+2)/(3x-1)$.

    (b) $f(x) = (e^x - 1)/(e^x + 1)$

21. True/False

    (a) If both $f(x)$ and $g(x)$ have domain D, then the domain of $f + g$ is also D.

    (b) In computing $\lim_{x \to a} f(x)$, the value of $f(a)$ is irrelevant.

    (c) If $\lim_{x \to a} f(x) = 0$ and $\lim_{x \to a} g(x) = 0$ then $\lim_{x \to a} \frac{f(x)}{g(x)}$ will not exist.

    (d) If $\lim_{x \to a} f(x) = 0$ and $\lim_{x \to a} g(x) = 0$ then $\lim_{x \to a} \frac{f(x)}{g(x)}$ will exist.

    (e) The equation $(\ln x)^6 = 6 \ln x$ holds for all real numbers $x > 0$?

    (f) If $f(x) = x^3$ then $f(x+2) = x^3 + 2$

    (g) If $f(x) = x + 5$ then $f^{-1}(x) = 1/(x+5)$

    (h) $\log_4 7 + \log_4 3 = \log_4 10$

    (i) $2 \ln x = (\ln x)^2$

    (j) $f(x) = \sin x$ has an inverse and that inverse is $\sin^{-1} x$ or $\arcsin(x)$.

22. Let $f(x) = \sqrt{4 - 2x}$

    (a) Domain of f is:

    (b) Show that f is one to one.

    (c) Find a formula for $f^{-1}(x) =$