Test 2 Review

October 23, 2018

1. Evaluate the following limits, if they exist.

   (a) $\lim_{x\to 4} \dfrac{16-x^2}{x^3+64}$

   (b) $\lim_{x\to 4} \dfrac{\sqrt{x}-2}{x-4}$

   (c) $\lim_{x\to 5^-} \dfrac{|x-5|}{x-5}$

   (d) $\lim_{x\to \infty} \dfrac{x+3x^2}{4x-1}$

2. Is the following function continuous everywhere?

$$f(x) = \begin{cases} \dfrac{x^2+8x+12}{|x+6|} & x \neq -6 \\ 2 & x = -6 \end{cases}$$

3. What value of c would make the following function continuous everywhere?

$$f(x) = \begin{cases} \dfrac{(x+2)^3}{|x+2|} & x \neq -2 \\ c & x = -2 \end{cases}$$

4. Does the following function have any horizontal asymptotes?

$$f(x) = \frac{\sqrt{1+4x^6}}{2-x^3}$$

5. Differentiate the following by first-principles.

   (a) $f(x) = \pi x^{-2}$

   (b) $g(x) = \sqrt{9-2x}$

6. Differentiate the following functions.

   (a) $f(x) = e^{7.3}$

   (b) $H(u) = (3u - 1)(u + 2)$

   (c) $R(a) = (3a + 1)^2$

   (d) $y = \dfrac{x^2 + 4x + 3}{\sqrt{x}}$

   (e) $G(t) = \sqrt{5t} + \dfrac{\sqrt{7}}{t}$

   (f) $k(r) = e^r + r^e$

   (g) $z = \dfrac{A}{y^{10}} + Be^y$

   (h) $y = e^{x+1} + 1$

   (i) $h(r) = \dfrac{ae^r}{b + e^r}$

   (j) $y = \dfrac{s - \sqrt{s}}{s^2}$

   (k) $y = (z^2 + e^z)\sqrt{z}$

   (l) $V(t) = \dfrac{4 + t}{te^t}$

7. Find the equation of the tangent that passes through each function at the given point.

   (a) $y = x + \dfrac{2}{x}, \qquad P(2, 3)$

   (b) $y = \sqrt[4]{x} - x, \qquad P(1, 0)$

8. A line intersects the curve $f(x) = -3x^3 + 2x + 1$ at the points $(-1, 2)$ and $(1, 0)$. For what values of x would the tangent of $f(x)$ be parallel to this line?

9. Find a formula to describe the instantaneous rate of change for $g(t) = \dfrac{t}{e^t}$. Does $g(t)$ have any horizontal tangents?