MATH 12002 EXAM #1 Spring 2007

1. Evaluate the limit, if it exists.

   (a) $\lim_{h\to 0} \dfrac{(7-h)^{-1} - 7^{-1}}{h} =$

   (b) $\lim_{x\to 2} \dfrac{\sqrt{2x+5} - 3}{x-2} =$

   (c) $\lim_{x\to -2} \dfrac{3x^2 + 4x - 4}{5x^2 + 13x + 6} =$

   (d) $\lim_{x\to 27} \dfrac{2x^{2/3} - 1}{5x^{1/3} + 4} =$

   (e) $\lim_{x\to 3} \dfrac{(x+2)^2 - 25}{x-3} =$

2. Given the graph of f be able to find function values, values of the derivative at a particular point, limit values, values of x for which f discontinuous, values of x for which f is not differentiable.

3. Let $f(x) = 4x^2 - 5x + 7$.

   (a) Find $f'(x)$ using the definition of the derivative.

   (b) Find the slope of the tangent line to f at $x = -2$.

   (c) Find the equation of the tangent line in part (b).

4. Locate all the discontinuities for

$$f(x) = \frac{9}{\sqrt{3} + 2\sin 3x}$$

5. Let $f(x) = \sqrt{x}$. Find $f'(4)$ using the definition of the derivative.

6. Given the graph of f sketch the graph of f'

7. Determine if the following functions are continuous or discontinuous at the given point a. If it is discontinuous at a, state which condition fails.

   (a) $f(x) = \begin{cases} 2x - 8 & \text{if } x < -3 \\ 5x + 1 & \text{if } x \geq -3 \end{cases}$ $\qquad a = -3$

   (b) $g(x) = \begin{cases} \dfrac{-2x^2 + 11x - 5}{x - 5} & \text{if } x \neq 5 \\ 9 & \text{if } x = 5 \end{cases}$ $\qquad a = 5$

   (c) $h(x) = \dfrac{\sqrt{x+1} - 2}{x - 3} \qquad a = 3$

ANSWERS

1. (a) $\frac{1}{49}$

   (b) $\frac{1}{3}$

   (c) $\frac{8}{7}$

   (d) $\frac{17}{19}$

   (e) 10

2. See instructor for this type of problem.

3. (a) $8a - 5$

   (b) $m = -21$

   (c) $y = -21x - 9$

4. $x = \frac{4\pi}{9} + \frac{2\pi n}{3} \quad x = \frac{5\pi}{9} + \frac{2\pi n}{3}$

5. $\frac{1}{4}$

6. See instructor for this type of problem.

7. (a) continuous at $x = -3$

   (b) Discontinuous at $x = 5$ since $\lim_{x \to 5} g(x) \neq g(5)$.

   (c) Discontinuous at $x = 3$ since h is undefined at 3.