MATH 178 Exam 1

Name:_____

Show all work leading to an answer. Circle or box final answer.

1. Evaluate the following limits without using tables or graphs

a) $\lim_{x\to 1} \sqrt{x^2+2x+1}$ *b)* $\lim_{x\to 2} \dfrac{x-2}{3x^2-5x-2}$

c) $\lim_{x\to 1} \dfrac{x^2-1}{x^3-x^2}$

2. The derivative of the function $f(x) = 3x^2 - x + 4$ is $f^{\,1}(x) = 6x - 1$

Use this result to **find the equation** of the line tangent to the graph of f at the point $(1, 6)$.

3. Given $f(x) = \begin{cases} 3-x & if \quad x \geq 2 \\ x+5 & if \quad x < 2 \end{cases}$

a) Graph

b) Is $f(x)$ continuous at x = 2 ?

c) If $f(x)$ is not continuous, indicate which of the three conditions is violated.

4. Find the derivative of $f(x) = 3x^2 - 4x + 10$ **using the definition of the derivative:**

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

(you must show ALL steps leading to the final answer to receive credit)

5. Find the derivative of each function below using the **appropriate rule** (product, quotient, power). Simplify whenever possible.

$\frac{d}{dx}\ f \cdot g = f^{/}g + fg^{/}$ $\qquad$ $\frac{d}{dx}\frac{f}{g} = \frac{gf^{/} - g^{/}f}{g^2}$ $\qquad$ $\frac{d}{dx}(g(x))^n = n \cdot (g(x))^{n-1}g^{/}(x)$

a) $f(x) = (x^2+1)(x^2-1)$

b) $f(x) = \dfrac{x^3-1}{x+1}$

c) $f(x) = 3x^2 + \frac{1}{\sqrt{x}} + \sqrt[3]{x^2}$

d) $f(x) = \sqrt{\frac{x+1}{x-1}}$

e) $f(x) = 3x\sqrt{x^2+1}$

6) $\qquad f(x) = \dfrac{x-1}{2x}$

a) Find $f^{\,//}(x)$ $\qquad$ b) Find $f^{//}(3)$.

7) Evaluate the expression:

$$\frac{d^2}{dx^2}(4x^3)\Big|_{x=1}$$