Name ______________________________________ Date __________________ Period ____

Continuity Review

1. $f(x) = 2x^2 - 3$

   a. Find the average rate of change of $f(x)$ on [1,5].

   $f(1) = 2(1^2) - 3 = -1$

   $f(5) = 2(5^2) - 3 = 47$

   $(1,-1)$ $(5,47)$

   $\frac{47 - -1}{5-1} = \frac{48}{4}$

   avc. vel $= 12$

   b. Find the instantaneous rate of change of $f(x)$ at $x = 3$.

   $f'(x) = \lim_{h \to 0} \frac{2(x+h)^2 - 3 - (2x^2 - 3)}{h}$

   $\frac{\cancel{2x^2} + 4x\cancel{h} + 2h^{\cancel{2}} \cancel{-3} \cancel{-2x^2} \cancel{+3}}{\cancel{h}}$

   $\lim_{h \to 0} 4x + 2h$

   $f'(x) = 4x$ $\quad 4(3) = 12$

   c. Find $f'(2)$.

   $f'(2) = 4(2) = 8 \leftarrow m$

   d. Find the equation of the tangent at $x = 2$.

   $f(2) = 2(2)^2 - 3 = 5$ ↓ y-value

   $y - 5 = 8(x - 2)$

   $y - y_1 = m(x - x_1)$

2. Find a value for $f(\cancel{3}5)$ that would make $f(x) = \frac{x^2 - 25}{x - 5}$ continuous at $x = 5$.

   $\lim_{x \to 5} \frac{(x+5)(x-5)}{x-5} = x + 5$

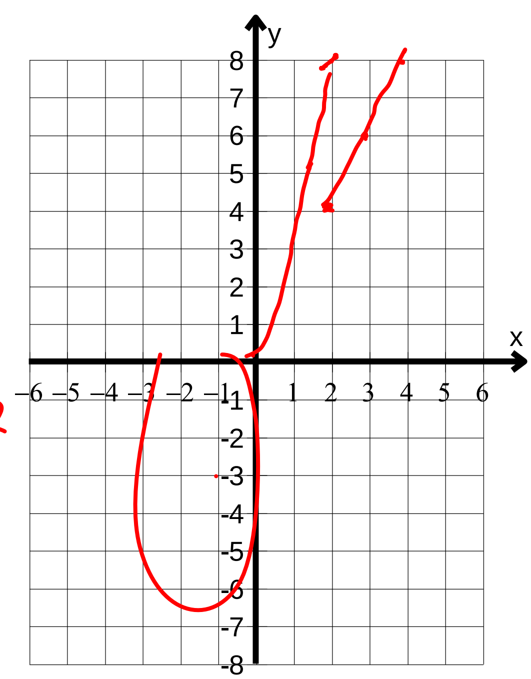
   $5 + 5 = 10$

3. $f(x) = \begin{cases} 2x - 1 & x < 0 \\ 2x^2 & 0 \le x < 2 \\ 2x & x \ge 2 \end{cases}$

   a. Graph the function

   b. Determine where it is discontinuous. at 0 and 2

   c. Determine the intervals of continuity



4. Using the Intermediate Value Theorem – Prove there is a root on $f(x) = x^3 - 3x + 1$ on the interval [0,1]

$f(0) = 0^3 - 3(0) + 1 = 1$

$f(1) = 1^3 - 3(1) + 1 = -1$

By IVT, the signs change on the interval [0,1] proving the graph crosses the x-axis.

5. $F(n)$ is a function which represents the cost in dollars for producing *n* number of copies of an advertisement

n	10	20	30	40
F	1000	1200	1800	3000

a. Find the average rate of change on the following interval [10,20]

$\text{ave} = \frac{1200-1000}{20-10} = \frac{200}{10} = 20$ copies per dollar

b. Find the average rate of change on the following interval [20,30]

$\text{ave} = \frac{1800-1200}{30-20} = \frac{600}{10} = 60$ copies per dollar

c. Find the instantaneous rate of change at n = 20

$\frac{20+60}{2} = 40$ copies per dollar

d. What does ***F'(n)*** mean?

change the rate of of cost as copies increase

e. What are the units of ***F'(n)?***

copi~~er~~ / dollar