Math 2143 - Brief Calculus with Applications

Test #1 - 2013.02.14

Name: _____

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1. Compute the following limits.

(a) $\lim_{x \to 2} x^2+4x-8$

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

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

(d) $\lim_{x \to 1^+} \dfrac{|x - 1|}{x - 1}$

(e) $\lim_{x \to 1^-} \dfrac{|x - 1|}{x - 1}$

2. Compute the following derivatives.

(a) $\dfrac{d}{dx}\left(x^3 - 4x^2 + 2\right)$

(b) $\dfrac{d}{dw}\left(w^3 - \dfrac{4}{w^2} + 2\right)$

(c) $\dfrac{d}{dz}\left(\sqrt{z^3 - 4z^2 + 2}\right)$

(d) $\dfrac{d}{dx}\left(\dfrac{x^3 - 4x^2}{3x^2 - 2\sqrt{x} - 1}\right)$

3. Find the equation of the tangent line to the function $f(x) = \sqrt{4x^2 - 2x + 1}$ at $x = \frac{1}{2}$.

4. Sketch the graph of the function $r(x) = \dfrac{(3x-2)(x+4)}{(2x+1)(x-2)}$ based on calculations of asymptotes and intercepts.

5. Sketch the graph of the function $f(x) = x^3(x-1)$. Before doing so, compute all of the following to help you in graphing the function: (a) the roots, (b) y-intercept, (c) intervals of increase and decrease, (d) critical points, (e) intervals of concavity, and (f) inflection points.

6. Approximate $\sqrt[3]{26}$ as a fraction using the tangent line to the function $f(x) = x^{1/3}$ at $x = 27$.

7. You are filling up a can with water. The can is cylindrical in shape, with diameter 6 cm. At what rate is the volume of water in the can increasing if the height of the water in the can is increasing by 1 cm/sec and is at a height of 10 cm in the can?