Honors PreCalculus Name:____________________________

Dr. Quattrin

Limits and Derivatives Test

CALCULATOR ALLOWED Score ___________

Round to 3 decimal places. Show all work.

1. Find the instantaneous rate of change of $f(x) = x^2 - \frac{1}{2x}$ at $x = -1$.

a) 0 b) $-\frac{3}{2}$ c) $\frac{3}{2}$ d) $-\frac{5}{2}$ e) $\frac{5}{2}$

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2. If $f(x) = x^2 + 3x + 2$, then $\lim_{x \to 4} \frac{f(x) - f(4)}{x - 4} =$

a) 0 b) $-\frac{3}{2}$ c) 11 d) 30 e) None of these

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3. Suppose *f* is a differentiable function such that $f(-1) = 2$ and $f'(-1) = \frac{1}{2}$. Using the line tangent to the graph of $f(x)$ at $x = -1$, find the approximation of $f(1.1)$

a) -3.05 b) -1.95 c) .95 d) 1.95 e) 3.05

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4. Find an equation of the normal line to the curve $f(x)=\frac{2}{x}$ at $x=1$.

(a) $y=\frac{1}{2}x+\frac{3}{2}$ (b) $y=-\frac{1}{2}x$ (c) $y=\frac{1}{2}x+2$

(d) $y=-\frac{1}{2}x+2$ (e) $y=2x+5$

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5. Let $f(x)=x-\frac{1}{x}$. Find $f''(x)$.

a) $1+\frac{1}{x^2}$ b) $1-\frac{1}{x^2}$ c) $\frac{2}{x^3}$

d) $-\frac{2}{x^3}$ e) Does not exist

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6. A particle moving in a straight line such that $x(t)=2+7t-t^2$. When is the particle at rest?

a) $t=1$ b) $t=2$ c) $t=\frac{7}{2}$

d) $t=4$ e) $t=5$

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Limits and Derivatives Test

CALCULATOR ALLOWED Score __________

Round to 3 decimal places. Show all work.

1. Use the equation of the line tangent to $y = 6x^3 - 3x^2 + 5x - 4$ at $x = -1$ to approximate $f(-1.1)$

2. The motion of a particle is described by $x(t) = -3t^3 + 7t^2 - t + 1$.

a) When the particle is stopped?

b) Which direction it is moving at $t = 7$?

c) Where is it when $v(t) = 0$?

d) Find $a(7)$.

3. A particle's position $\langle x(t), y(t)\rangle$ at time t is described by $\left\langle t^3+t^2-2t+1, -35t+2\right\rangle$.

a) Find the speed at $t=3$.

b) When, if ever, is the particle stopped? Prove it.

Honors PreCalculus
Dr. Quattrin
Limits and Derivatives Test
NO CALCULATOR ALLOWED

Name:______________________________

5. Set up, but do not solve, the limit definition of the derivative for

$y = \sqrt[3]{x^6} + \frac{4}{x^4} - 2\sqrt[5]{x^9} - 4^2$

6. Use the Power Rule to find:

a) $\frac{d}{dx}\left[-12x^4 + 7x^3 + \pi x^2 + 42x\right] =$

b) $D_x\left[\sqrt[3]{x^6} + \frac{4}{x^4} - 2\sqrt[5]{x^9} - 4^2\right] =$

7. Evaluate the following limits:

a) $$\lim_{x\to 4} \frac{2x^3-128}{x^4-256}$$

b) $$\lim_{x\to 2} \frac{x^4-5x^3-7x^2+3x+1}{x^3+7x-22}$$

EC) $$\lim_{x\to 2} \frac{\sqrt{x^2+1}-\sqrt{5}}{x^2-3x+2}$$