Honors PreCalculus Name:_____
Dr. Quattrin
Limits and Derivatives Test
CALCULATOR ALLOWED Score _____
Round to 3 decimal places. Show all work.

1. If $\lim_{x\to a}\frac{x^4-a^4}{x^2-a^2}=16$, then $a=$

a) 2 b) $2\sqrt{2}$ c) 4 d) $4\sqrt{2}$ e) 8

2. An equation of the line normal to the graph of $y=7x^4+2x^3+x^2+2x+5$ at the point where $x=0$ is

a) $x+2y=10$ b) $2x+y=10$ c) $5x+5y=2$

d) $2x-y=-5$ e) $2x+y=-10$

3. If $f(x)=\sqrt{x^2-1}$, which of the following is equal to $f'(3)$?

(a) $\lim_{x\to 3}\frac{\sqrt{(x+h)^2-1}-\sqrt{8}}{x-3}$ (b) $\lim_{h\to 0}\frac{\sqrt{(x+h)^2-1}-\sqrt{x^2-1}}{h}$

(c) $\lim_{h\to 0}\frac{\sqrt{(x+h)^2-1}-\sqrt{8}}{h}$ (d) $\lim_{x\to 3}\frac{\sqrt{x^2-1}-\sqrt{8}}{x-3}$

(e) $\lim_{h\to 0}\frac{\sqrt{x^2-1}-\sqrt{8}}{x-3}$

4. If the line tangent to $y=2x^2+x+k$ is the line $3x+y=1$, then $k=$

a) 1 b) 2 c) 3 d) 4 e) 5

5. At what point on the graph of $y=\frac{1}{4}x^4$ is the tangent parallel to the line $8x+27y=3$

(a) $\left(\frac{8}{27},\frac{2}{3}\right)$ (b) $\left(\frac{2}{3},\frac{4}{81}\right)$ (c) $\left(-\frac{2}{3},-\frac{8}{27}\right)$

(d) $\left(-\frac{3}{2},-\frac{1}{2}\right)$ (e) $\left(-\frac{2}{3},\frac{4}{81}\right)$

6. A particle moving in the *xy*-plane with its *x*-coordinate given by $x(t)=\frac{1}{4}t^4+\frac{2}{3}t^3+\frac{1}{2}t^2-1$ and its *y*-coordinate given by $y(t)=\frac{1}{2}t^2-t+1$. When the particle is moving up it is also

(a) moving right
(b) moving left
(c) at rest
(d) cannot be determined
(e) does not exist

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1. Use the equation of the line tangent to $y = 6x^3 - 3x^2 + 5x - 4$ at $x = 1$ to approximate $f(.9)$

2. The motion of a particle is described by $x(t) = t^3 - 6t^2 + 9t + 1$.

a) When the particle is stopped?
b) Which direction it is moving at $t = 3$?
c) Where is it when $t = 3$?
d) Find $a(3)$.

3. A particle's position $\langle x(t), y(t) \rangle$ at time t is described by $\langle t^3 - 6t^2 + 9t + 1, -t^2 + 6t + 2 \rangle$. When is the particle moving right and down?

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3. Set up, but do not solve, the limit definition of the derivative for $y = 6x^4 - 2x^3 + \pi^2 + 4x$

4. Use the Power Rule to find:

a) $\frac{d}{dx}\left[4x^5 - x^3 + \pi x + 421\right]$

b) $D_x\left[\sqrt[4]{x^7} - \frac{6}{x^5} - \sqrt[3]{x} + \pi^2 x\right]$

5. Evaluate the following limits:

(a) $\lim_{x \to 1} \frac{x^3 - 1}{x^2 + 3x - 4}$

(b) $\lim_{x \to 9} \frac{x^3 - 9x^2 - 5x + 45}{x^2 - 11x + 18}$