Name: _____

Clear your desk of everything excepts pens, pencils and erasers. If you have a question raise your hand and I will come to you.

1. (2 points) **Multiple Choice. No work needed. No partial credit available.** The tangent line to the curve $y = \frac{1}{x^2-1}$ is horizontal at the following points:

   A. $x = 0$ and $x = 1$.

   B. $x = 0$ only.

   C. $x = 1$ and $x = -1$.

   D. $x = 1$ only.

   E. None of the above.

2. (1 point) **Fill-in-the-Blank. No work needed. No partial credit available.** The limit

$$\lim_{t\to 0} \frac{\sin(2t)}{\sin(t^3+3t)}$$

   is _____.

Extra Work Space.

(1) $\frac{dy}{dx} = \frac{0-1(2x)}{(x^2-1)^2}$ ← Quotient Rule

$= \frac{-2x}{(x^2-1)^2}$

Derivative is 0 when $-2x = 0 \rightsquigarrow x = 0$.

(2) $\lim_{t\to 0} \frac{\sin(2t)}{\sin(t^3+3t)} = \lim_{t\to 0} \frac{\sin(2t)}{2t} \cdot \frac{t^3+3t}{\sin(t^3+3t)} \cdot \frac{2t}{t^3+3t}$

$= 1 \cdot 1 \cdot \lim_{t\to 0} \frac{2}{t^2+3}$

$= \frac{2}{3}$

Continue on to back side

3. (2 points) Find the derivative of the function $f(x) = \sin(\frac{x}{x+\sqrt{x}})$. You do not need to simplify your answer.

$$f(x) = \sin\left(\frac{x}{x+\sqrt{x}}\right)$$

$$f'(x) = \cos\left(\frac{x}{x+\sqrt{x}}\right) \cdot \frac{d}{dx}\left(\frac{x}{x+\sqrt{x}}\right) \quad \text{Chain Rule}$$

$$= \cos\left(\frac{x}{x+\sqrt{x}}\right) \cdot \frac{1(x+\sqrt{x}) - x\left(1+\frac{1}{2\sqrt{x}}\right)}{(x+\sqrt{x})^2} \quad \text{Quotient Rule}$$