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**CALCULATORS, MOBILE PHONES AND PAGERS ARE NOT ALLOWED**

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**Answer the following questions**

1. [4pts] Evaluate each of the following limits, if it exists

(a)  $\lim_{x \rightarrow 1} \frac{\sqrt{2x^3 - 1} - 1}{x - 1}$ ,

(b)  $\lim_{x \rightarrow 0} \left( \sqrt{1 + x^2} + \frac{x^2}{\sec(1/x)} \right)$ .

2. [4pts] Use the definition of the derivative to find  $f'(0)$  if  $f(x) = \frac{1}{\sqrt{x+1}}$ .

3. [4pts] Find  $f'(x)$ , where  $f(x) = \sin^3 \left( \frac{x}{\sqrt{2x^2 + 1}} \right)$ .

4. [4pts] Find vertical and horizontal asymptotes, if any, for the graph of

$$f(x) = \frac{|x - 3|(x + 7)}{x^2 - 5x + 6}.$$

5. [4pts] Let

$$f(x) = \begin{cases} |x| + \frac{\sin^3(Ax)}{x^3} & \text{if } x < 0 \\ 8 & \text{if } x = 0 \\ \sqrt{x} + B & \text{if } x > 0. \end{cases}$$

Find the values of  $A$  and  $B$  such that  $f$  is continuous at  $x = 0$ .

6. [5pts]

(a) State the Intermediate Value Theorem

(b) Let  $f(x) = 2x \sin(x) + x + 1$ . Show that there is a point  $P$  on the graph of  $f$  at which the the tangent line is parallel to the straight line  $y - 2x + 1 = 0$ .