

Name: _____

TA's Name: _____

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score					

Instructions: You must show supporting work to receive full and partial credits. No text book, notes, formula sheets allowed.

1(14pts) (7pts each) (a) Find the limit of

$$\lim_{x \rightarrow 1} \frac{x^2 + x - 2}{2x^2 - x - 1}$$

both graphically (copy your calculator graph blow) and numerically (using the sequence 1.1, 1.01, 1.001, 1.0001, 1.00001.)

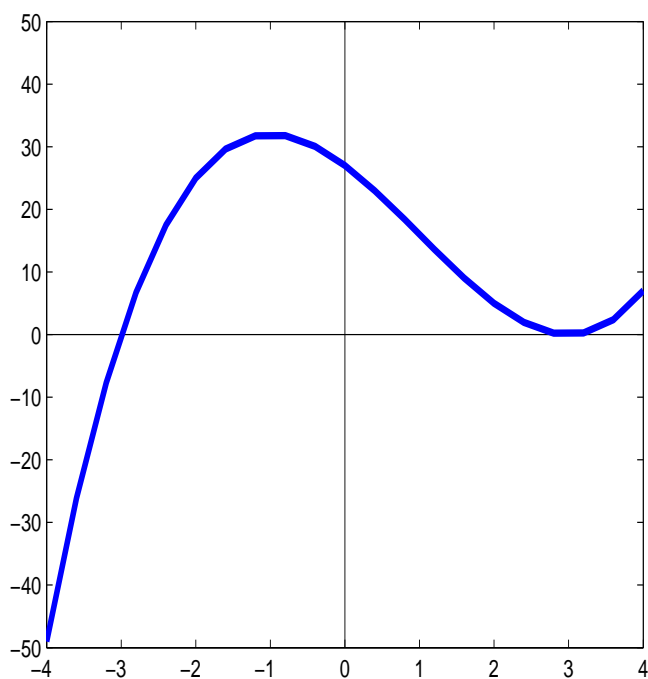
(b) Find the same limit **analytically**. (Numerical and graphical means are not accepted.)

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2(14pts) (7pts each) (a) Estimate the slope of the function $y = f(x) = x^2 + 1$ at $x = 2$.

(b) Approximate the length of the curve $y = f(x) = x^2 + 1$ over the interval $[0, 1]$, using 2 secant line segments.

3(15pts) (5pts each) The graph of a function $y = g(x)$ is given below. Sketch the graphs of (a) $g(2x)$, (b) $g(x + 1)$, (c) $g(x)/3 + 10$. (Label all graphs.)



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4(14pts) (7pts each) (a) A sequence is defined recursively as follows: $a_1 = 0$, $a_n = \frac{1}{1 + a_{n-1}}$. Determine the first 10 terms of the sequence, i.e. a_1 through a_{10} . Do you think the sequence has a limit? If you do, approximate the limit to 2 decimal places.

(b) Use the idea of Squeeze Theorem to determine the limit $\lim_{x \rightarrow \infty} \frac{x + \sin x}{2x + 1}$.

5(14pts) (7pts each) (a) Find the exact solutions of $2 \sin^2 x - \sin x = 1$.

(b) Find the exact solution of $e^{2 \ln x} - 1 = 0$. (Comment: if π is part of the answer, an approximation such as 3.14... will not be accepted as an answer.)

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6(15pts) Find the discontinuity of the function $f(x) = \frac{e^x - 1}{x^2 - x}$. For each discontinuity that is removable, define a new function that removes the discontinuity. (Show your work, numerical or graphical or analytical, on all relevant limits.)

7(14pts) (7pts each) Given the function $f(x) = \frac{x - 4}{x - 2\sqrt{x}}$.

(a) Find all the horizontal asymptotes. (Show your work on all relevant limits.)

(b) Find all the vertical asymptotes. (Show your work on all relevant limits.)

2 Bonus Points: Karl Weierstrass was a (circle all that apply): (a) fencer, (b) philosopher, (c) mathematician, (d) musician. (... *The End*)