page	1	2	3	4	total
score					

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

1(16pts) (8pts each) Find the limits analytically. Numerical or graphical work will not be credited.

(a) $\displaystyle\lim_{x \to 2} \frac{x-2}{x^2 - 5x + 6}$

(b) $\displaystyle\lim_{x \to \infty} \frac{2x^2 - \sqrt{x} + 1}{x^2 + x - 1}$

2(16pts) (8pts each) (a) Use your calculator to estimate the limit of the sequence

$$\lim_{n\to\infty} \left(1 - \frac{1}{2n}\right)^n$$

using $n = 1, 10, 100, 10^3, 10^4, 10^5, 10^6$.

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

3(18pts) (a)(8pts) Use the Squeeze Theorem to determine the limit

$$\lim_{x\to\pi} \sin x \cos \frac{1}{(x - \pi)^2}$$

(Make sure to verify all the conditions of the theorem.)

(b)(10pts) Find an equation of the tangent line to the function $f(x) = x + \sqrt{x}$ at the point $a = 4$.

4(12pts) (6pts each) (a) Use the Intermediate Value Theorem to show that there is a zero point in the interval $[1, 2]$ for the function $f(x) = x^3 - 5x + 3$. (Make sure to verify all the conditions of the theorem.)
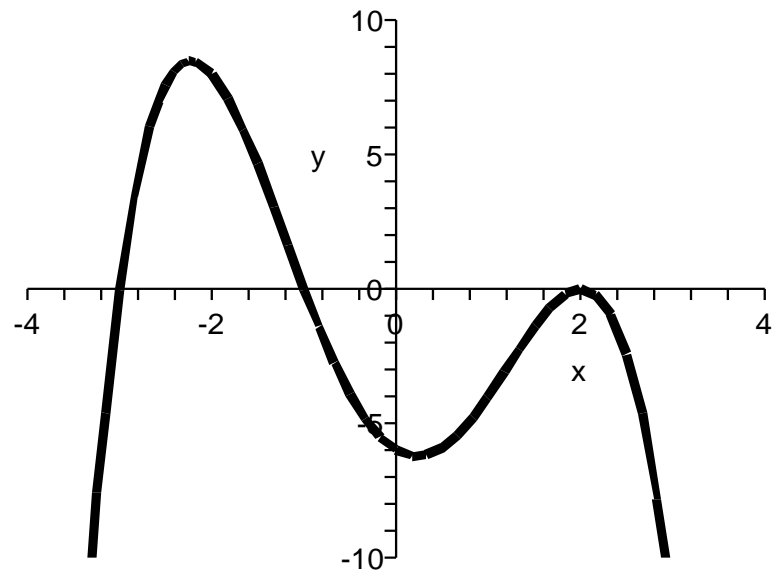
(b) Then use the method of bisections to find an interval of length $1/4$ which contains the zero.

5(10pts) (5pts each) The graph of a function $y = f(x)$ is given. Sketch the graphs of (a) $-2f(x)$, (b) $f(2x)$. (Label all graphs.)
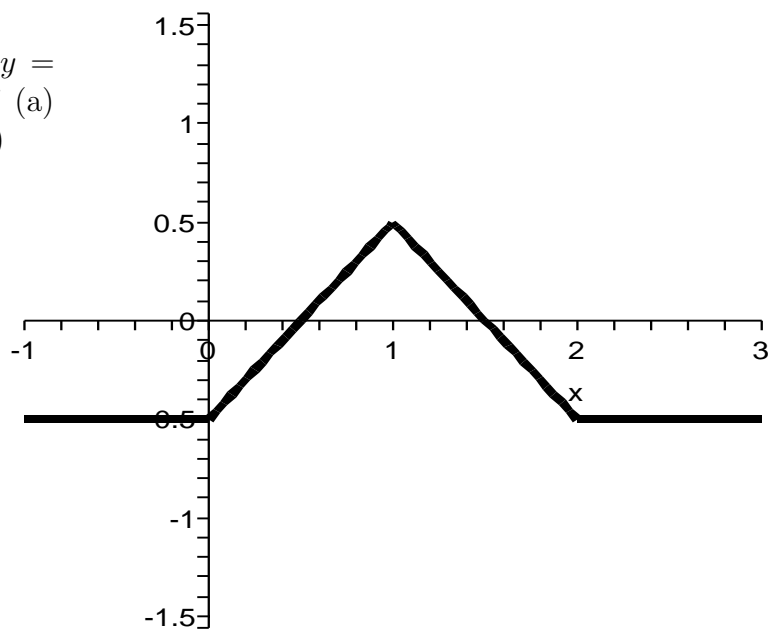
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6(10pts) The graph of a function $y = f(x)$ is given. Sketch the graph of its derivative $f'(x)$.

7(18pts) (a)(10pts) Use the definition to find the derivative function $f'(x)$ if $f(x) = \dfrac{1}{x+1}$.

(b)(8pts) A function f is given by the table below.

x	1.4	1.6	1.8	2	2.2	2.4	2.6
$f(x)$	1.1	0.9	0.8	1	1.3	1.4	1.2

Estimate the derivative $f'(2)$.

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2 Bonus Points: Calculus was invented in: (a) The 17th century. (b) The 18th century. (c) The 20th century.
<div align="right">(... The End)</div>