

Important Note: On this exam and future exams as well, your work must be shown to receive full credit. Calculators that have a built-in computer algebra system (CAS) are not permitted. Examples of such calculators include (but not all): TI-89, TI-92, TI-Nspire, HP-40, HP-41. Put away cell phones and other illegal electronic devices.

No.	1	2	3	4	5	6	7	8	Total
Score									

(1) (24 points) Find $\frac{dy}{dx}$ for each of the following functions (You Need Not Simplify):

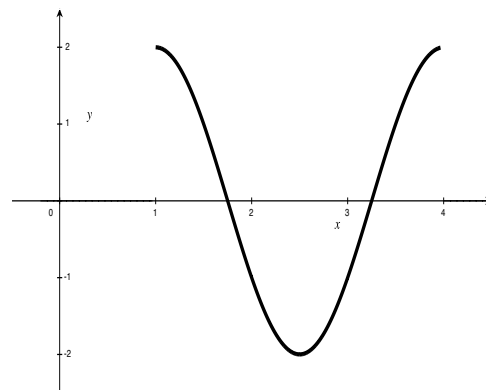
(a)(8 points) $y = e^x \arcsin(x) + \sin(3x) + \ln x$.

(b)(8 points) $y = \frac{2^x - \cos(4x)}{x^2 + \sec x}$.

(c)(8 points) $y = \left(\ln(5x + 4) + \tan^{-1}(\sqrt{x}) \right)^{10}$.

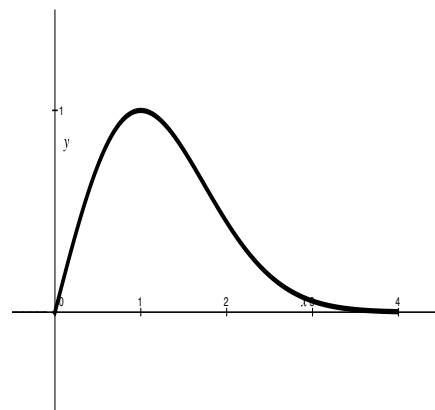
(2) (10 points) By using the definition of the derivative only, find the exact value of $f'(2)$ if $f(x) = x^2 - x$. Any other method of computing $f'(2)$ will receive no credit.

- (3) (8 points) The graph below is the graph of a sinusoidal $y = g(x)$. Based on the graph, find the **period**, **amplitude**, and a possible formula for $g(x)$.



- (4) (10 points) Let $y = f(x)$ be a function whose graph is as shown below.

- (a)(5 points) From the graph find the average rate of change of f on the interval $[1, 4]$.



- (b)(5 points) On a separate set of axes, sketch a reasonable graph of $y = f'(x)$ in the space below.

(5) (14 points) In this problem, answers such as 2.3456 are not acceptable and will not receive any credit. So do not use your calculator and show all of your work.

(a)(7 points) Find all values of x that satisfy: $\log_2(x - 1) + \log_2(2x + 2) = 3$.

(b)(7 points) Find the exact value of: $\tan\left(\sin^{-1}\frac{2}{7}\right)$.

(6) (12 points) Suppose $y = f(x)$ is a differentiable function whose tangent line at $x = 3$ is given by $4x + y = 7$.

(a)(6 points) Find $f(3)$ and $f'(3)$

(b)(6 points) Let $g(x) = f(4x^2 - \frac{1}{x})$. Find $g'(1)$. Make sure to justify your answer by using the chain rule properly.

(7) (10 points) Let $F(x) = \frac{3x+4}{x-1}$.

(a)(6 points) Evaluate the following limits by showing proper work:

- $\lim_{x \rightarrow \infty} F(x)$

- $\lim_{x \rightarrow 1^+} F(x)$

- $\lim_{x \rightarrow 1^-} F(x)$

(b)(2 points) Does F have a horizontal asymptote? If yes, what is it?

(c)(2 points) Does F have any vertical asymptotes? If yes, what are they?

(8) (12 points) Let

$$G(x) = \begin{cases} x^2 - 5; & -\infty < x \leq 1 \\ kx + 1; & x > 1, \end{cases}$$

where k is a constant.

(a)(8 points) Compute: $\lim_{x \rightarrow 1^+} G(x)$ and $\lim_{x \rightarrow 1^-} G(x)$.

(b)(4 points) Find the value(s) of k for which the function G is continuous on $(-\infty, \infty)$. Make sure to show all of your work to receive full credit.