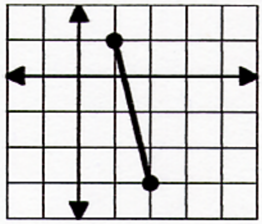
1. How many points of inflection does the graph of $y = 2x + \cos(x^2)$ have in the interval (0, 5)

2. The graph of part of a linear function f is given. Each tick mark represents a unit of 1. Find h '(1) if $h(x) = \sqrt{f(x) + x^2}$.



3. Water flowed into a tank at an increasing rate r(t) from t = 0 to t = 10. The rate of flow r(t) in m^3/min was measured at one minute intervals with the results shown in the table below.

t	0	1	2	3	4	5	6	7	8	9	10
r(t)	3	5	8	11	15	17	20	22	26	30	32

Use Riemann sums with **five rectangles** to estimate the total amount of water that flowed into the tank. Let A be the left rectangular approximation. Let B be the right rectangular approximation. Let C be the midpoint rectangular approximation. Find A + B + C.

4. Let R be the region in the first quadrant enclosed by $y = 5 - x^3$, $y = -\cos(x) + 1$, and x = 0. To the nearest thousandth find the volume of the solid generated when R is revolved about the x-axis.

5. List the letters of the functions that are differentiable at x = 0.

A) $y = |x^2 - 3x|$ B) $y = |x^3 - 4x^2|$ C) $y = \sqrt{x^2 + 0.01} - |x - 1|$

D) $y = \sin^2(x)$ E) $y = \dfrac{e^x}{\cos(x)}$ F) $y = \sqrt{x^2 + 0.01} - 0.01$

6. $f'(x) = ax^2 + bx$. At x = 2 the normal is parallel to x - 4y = 2. f "(2) = 10. Find f '(1).

7. A meteorologist determines that the temperature T (in ^oF) on a cold winter day is given by $T = \frac{1}{20}t(t-12)(24-t)$, where t is time (in hours) and t = 0 corresponds to midnight.
To the nearest thousandth let **A** be the average temperature between 7 a.m. and 12 noon.
To the nearest hour (after midnight), let **B** be the hour when the temperature is increasing at the fastest rate.
To the nearest thousandth let **C** be the highest temperature attained during the day.
To the nearest thousandth let **D** be the average rate of change in the temperature from 6 a.m. to 1 p.m. Find A + B + C +D.

8. Let A(w) be the area in square centimeters of the region in the first quadrant enclosed by the x-axis and the graph of $f(x) = 36x^2 - 18x^3$ between x = 0 and x = w, 0 < w < 2. If w moves right at a constant rate of 0.04 cm/s, how fast is A(w) changing in cm^2/s, when w = 0.5?

9. A target is in the shape of a closed polygon whose area is equal to that bounded by $y = 4\ln(x)$ and $y = 1.5x - 2$. Painted on the polygon is a red shape whose area is equal to that bounded by $x = 0$, $y = e^x$ and $y = 2\cos(x)$ in quadrant 1. If a randomly thrown dart hits the polygon what is the probability **to the nearest thousandth** that it lands in the red area?

10. Use the local linearization of $x^4 + x\tan(y) = 16$, $\frac{-\pi}{2} < y < \frac{\pi}{2}$ at $x = 2$ to estimate the value of y at $x = 2.1$.

11. $$f(x) = \begin{cases} (x+2)^2 - 2, -4 \le x \le -2 \\ x, -2 < x < 0 \\ \tan(x), 0 \le x \le \frac{\pi}{4} \\ e^{x-\frac{\pi}{4}}, \frac{\pi}{4} < x \le 3 \end{cases}$$

Find the area bounded by f and the x-axis **to the nearest thousandth**.

12. List the letters of the statements that are true.

A) If f is a one to one function then f is always increasing or always decreasing throughout its domain..

B) A critical value of f occurs only when $f'(x) = 0$.

C) If $u = 2x$, then $\int_0^{\frac{\pi}{4}} \sin(2x)\,dx = \frac{1}{2}\int_0^{\frac{\pi}{4}} \sin(u)\,du$.

D) If f and g are even functions then $\int_{-a}^{a} [f(x) + g(x)]\,dx = 2\int_0^a [f(x) + g(x)]\,dx$

E) If the velocity of a particle moving along the x-axis is $v(t) = \sin(t)$, then to the **nearest thousandth** the total distance traveled from $t = 0$ to $t = 4$ is 2.346.

F) A particle moving rectilinearly along the x-axis having velocity $v(t) = \frac{1}{1+t}$, $t \ge 0$, starting at (4, 0) when $t = 0$ has an x-coordinate of $\ln 8$ when $t = 7$.

13. A rectangle has its base on the x-axis and its upper vertices on the parabola $y = 16 - x^2$. What is the largest area the rectangle can have?

14. $\int_1^5 f(x)\,dx = 3$. Find $\int_1^5 [2(f(x) + x^2]\,dx - \int_5^1 [3f(x) - x + 4]\,dx$

15. Find the area bounded by $x = -y^3 + 2y + 4$ and $x = y^2 - 2y$.