



The Sharp EL-531 calculator may be used on this test.
Show all of your work in the space provided.
The number of marks for each question is indicated in brackets.

Mark:

25

1. If Newton's Method were used to approximate a zero of $f(x) = -x + 4\sqrt{x+1}$ using an initial approximation of $x_1 = 15$, then compute the next approximation x_2 .

[3]

2. A fugitive who is 2 meters tall runs straight away from a searchlight mounted 10 meters above a point O on the ground. The ground is horizontal and the runner's speed is 8 meters per second. How fast is the shadow of the runner's head moving along the ground when the runner is 25 meters from the point O ?

[5]

3. Let $f(x) = \frac{1}{2}x + \sin x$ for $0 \leq x \leq 2\pi$.

- (a) Find the open intervals on which f is increasing or decreasing and find the coordinates of all critical points. Classify each critical point as a relative maximum, minimum or neither.

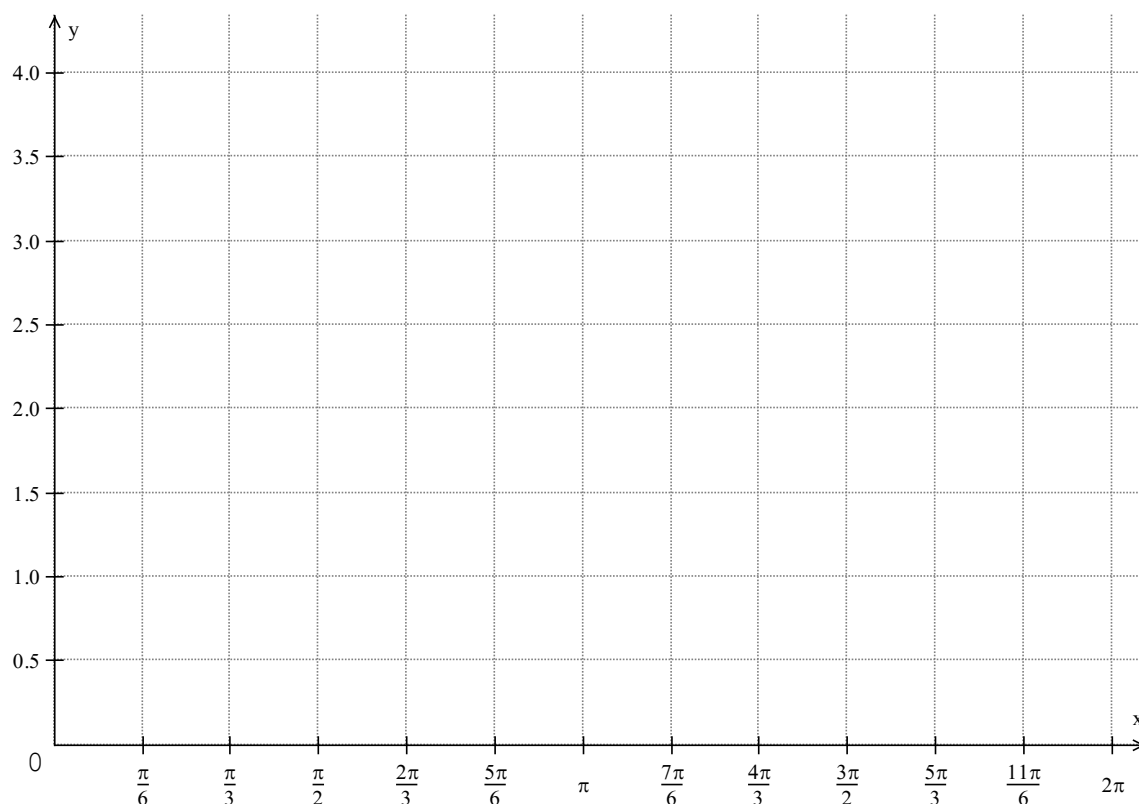
[3]

- (b) Find the open intervals on which the graph of f is concave upward or concave downward and find the coordinates of all inflection points.

[3]

- (c) Graph the function and label **all** critical points and inflection points.

[3]



4. Use **differentials** to approximate $\sqrt[3]{999}$. Express your answer as a fraction reduced to lowest terms.

[3]

5. Consider a rectangle of perimeter 12 inches. Form a cylinder by revolving this rectangle about one of its edges. What dimensions of the rectangle will result in a cylinder of maximum volume? Use the Second Derivative Test to verify that your answer produces a maximum.

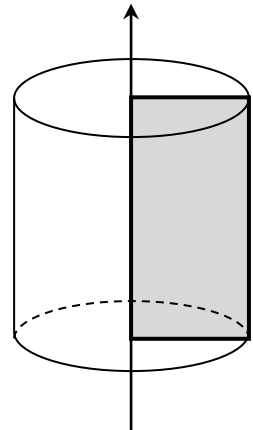


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[5]