Athabasca University

MATH 265

Assignment 4

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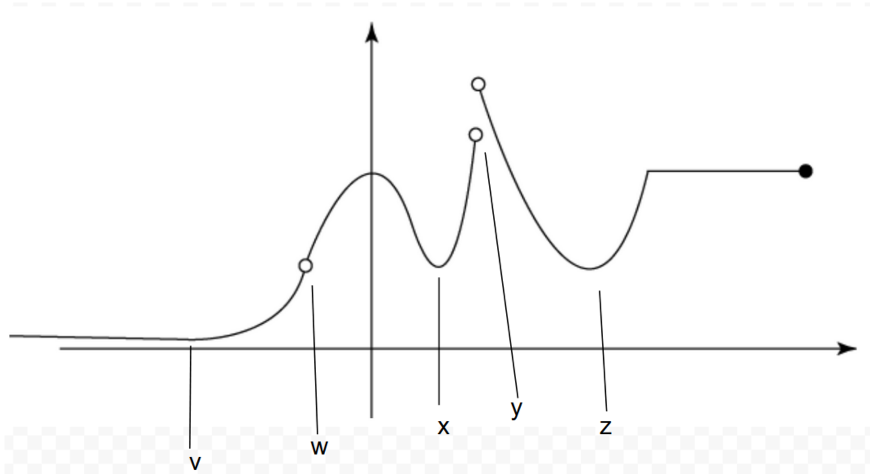
1. a)



The domain of the function g is $(-\infty, w) \cup (w, x) \cup (x, y]$

b) The function g is continuous from $(-\infty, w) \cup (w, x) \cup (x, y]$.

c) The local maximum ix at $x = 0$, since the derivative is 0.

d) The local minimum is at two points, x and z, where the derivative is zero.

e) There is no absolute maximum as the derivative at y is undefined, and y is not included in the domain.

f) The absolute minimum is at v. It appears as though the graph has negative slope as x decreases beyond v to infinity.

2.

3.

4. First, we need to find relative distances for swimming and jogging. Let's let $\angle PWE$ be θ. We can create a triangle by connecting points PWE with straight lines. We know from Thale's theorem that an angle inscribed across the diameter of a circle is always $90°$, so this triangle is a right triangle. Then, the swimming distance, line PW, is $3\cos\theta$. The arc length for jogging is θr, and our diameter is 3km, so the jogging distance is $2 \cdot 1.5\theta$. We must multiply by 2 since the angle is not measured at the center of the circle, but rather subtends it.

We know that critical points are found where the derivative of a function is 0 or undefined. To find the derivative, we can find an equation for the time of the journey, then differentiate.

$$\frac{1}{24} \cdot 3\theta + \frac{1}{3} \cdot 3\cos\theta$$

$$\frac{\theta}{8} + \cos\theta$$

We can then differentiate and find zeros.

$$0 = \frac{1}{8} - \sin\theta$$

$$\sin\theta = \frac{1}{8}$$

$$\sin^{-1}\left(\frac{1}{8}\right) = \theta$$

We have $\theta \approx 0.125$. To find the distance to jog, we multiply by 3. The final distance Peter should jog to arrive at point W in the least amount of time is $\boxed{0.376\text{km}}$

5.

6.