
Complete the following problems. Show all work to receive full credit.

1. Find the derivative of $f(x) = 2\sqrt{x}$.

This is another way of writing $f(x) = 2x^{\frac{1}{2}}$, so the derivative is

$$f'(x) = 2 \cdot \frac{1}{2} x^{-\frac{1}{2}} = \frac{1}{\sqrt{x}}$$

2. Does the curve $y = 2\sqrt{x}$ have any horizontal tangent lines? If so, where? If not, explain why not.

We are asked to set the derivative =0:

$$f'(x) = \frac{1}{\sqrt{x}} = 0$$

This can never happen, so the curve has no horizontal tangent lines.

3. At time $t \geq 0$, the velocity of a body moving along the x -axis is $v(t) = t^2 - 4t + 3$.

- (a) When is the body's velocity increasing? (the answer should be a time interval)

This happens when the body has positive acceleration:

$$a(t) = 2t - 4$$

$$a(t) > 0 \text{ when } 2t - 4 > 0$$

$$2t > 4$$

$$t > 2$$

Therefore the body's velocity is increasing when $t > 2$.

- (b) When is the velocity body moving forward? (the answer should be a time interval)

This is when the velocity is positive:

$$v(t) > 0 \text{ when } t^2 - 4t + 3 > 0$$

First we see when this is =0:

$$t^2 - 4t + 3 = 0$$

$$(t - 3)(t - 1) = 0$$

$$t = 3 \text{ or } t = 1$$

It is positive when $t < 1$ or when $t > 3$, so the body is moving forward during those times.