12. The position of a particle moving on the $x$-axis at time $t > 0$ seconds is: $x(t) = e^t - \sqrt{t}$ feet.

(a) Find the average velocity of the particle over the interval $1 \le t \le 3$.

(b) In what direction and how fast is the particle moving at $t = 1$ seconds?

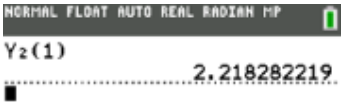
(c) When is the particle moving to the right?

(d) Find the position of the particle when its velocity is zero.

v ←

v > 0

b) $x'(1) = 2.218$ ft/sec




moving Rt at 2.218 ft/sec

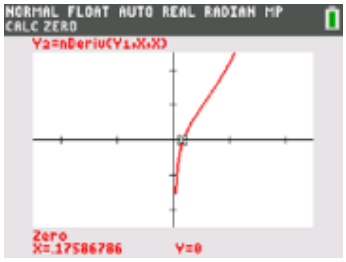
* what if $x'(1) = -3$

~~moving left at 3 ft/sec~~

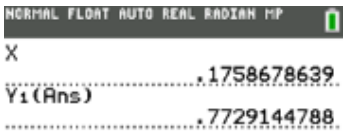
✓ moving left at 3 ft/sec

c) $t > .176$

b/c moving Rt → $v > 0$

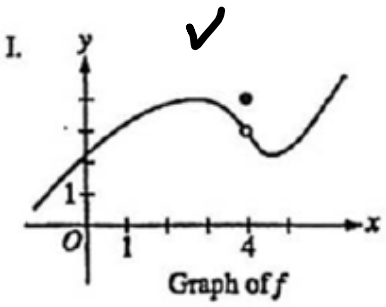



d) $x(.176) = .773$



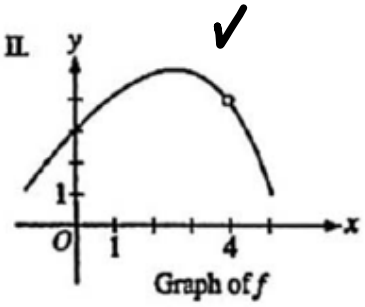
10. For which of the following does $\lim_{x \to 4} f(x)$ exist ?

I.



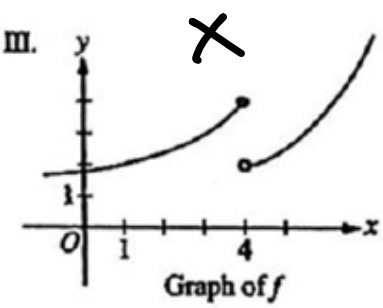

Graph of $f$

II.




Graph of $f$

III.




Graph of $f$

(a) I only (b) II only (c) III only (d) I and II only (e) I and III only

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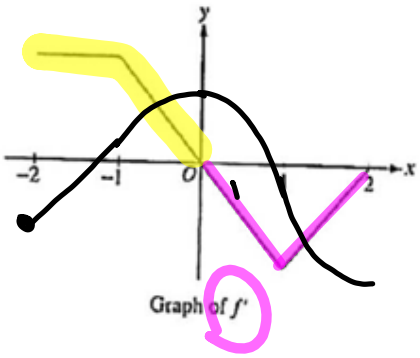
3. The graph of $f'(x)$, the derivative of the function $f$, is shown below. Which of the following statements is true about $f$ ?

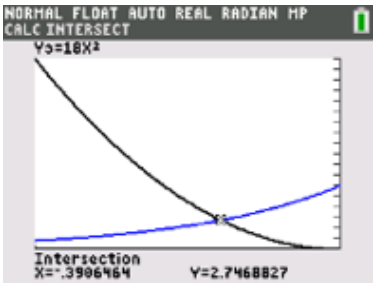
(a) $f$ is decreasing for $-1 \le x \le 1$.
(b) $f$ is increasing for $-2 \le x \le 0$.
(c) $f$ is increasing for $1 \le x \le 2$.
(d) $f$ has a local minimum at $x = 0$.
(e) $f$ is not differentiable at $x = -1$ and $x = 1$.



Graph of $f'$

13. Let $f$ be the function given by $f(x) = 3e^{2x}$ and let $g$ be the function given by $g(x) = 6x^3$. At what value of $x$ do the graphs of $f$ and $g$ have parallel tangent lines?

(a) -0.701 (b) -0.567 (c) -0.391 (d) -0.302 (e) -0.258




$f' = g'$

$6e^{2x} = 18x^2$

$f(1)=6$

18. Given: $f(x)=5x^3+x$. If $g(x)=f^{-1}(x)$, find $g'(6)$. $= \frac{1}{f'(1)} = \boxed{\frac{1}{16}}$

$6 = 5x^3+x$

$f(a)=b$ , $g(b)=a$,

$f'(x)=15x^2+1$

$f'(a)=\frac{1}{g'(b)}$

$f'(1)=16$