

1) If at time t , the position of a body moving along the s -axis is

$$s(t) = t^3 - 9t^2 + 24t$$

then find the total distance traveled by the body from $t = 0$ to $t = 4$ is

$$v(t) = 3t^2 - 18t + 24 = 0 \Rightarrow t^2 - 6t + 8 = 0$$

$$(t-4)(t-2) = 0$$

$$t = 2, \quad t = 4$$



$$\text{total dist} = |s(2) - s(0)| + |s(4) - s(2)|$$

$$s(4) = 4^3 - 9 \cdot 4^2 + 24 \cdot 4$$

$$= 4^2(4 - 9 + 6) = 4^2(1) = 16$$

$$s(2) = 2^3 - 9 \cdot 2^2 + 24 \cdot 2$$

$$= 2^2(2 - 9 + 12) = 4(5) = 20$$

$$\text{total dist} = |20 - 0| + |16 - 20| = 20 + 4 = \boxed{24}$$

2) if $f(x) = \frac{2^x + 5}{(\sqrt{x} + \frac{1}{\sqrt{x}})^2}$ then find

$$f'(2) =$$

$$f(x) = \frac{2^x + 5}{x + 2 + x^{-1}}$$

$$f'(x) = \frac{(1+x^{-2})(2^x+5) - (2^x \ln 2)(x+2+x^{-1})}{(x+2+x^{-1})^2}$$

$$f'(2) = \frac{(4 \ln 2)(4 + \frac{1}{2}) - (\frac{3}{4})(9)}{\frac{9}{16}}$$

$$= \frac{(4 \ln 2)(\frac{9}{2}) - \frac{27}{4}}{\frac{9}{16}} = \boxed{32 \ln 2 - 12}$$

3) Using the graph of f below, decide which one of the following inequalities is TRUE.

(a) $f'(2) < f'(d) < f'(c)$

(b) $f'(a) < f'(c) < f'(e)$

(c) $f'(-3) < f'(b) < f'(0)$

(d) $f'(0) < f'(b) < f'(e)$

(e) $f'(0) < f'(b) < f'(c)$

