Lessons 5-1 & 5-2 Extreme Values & the MVT HW Key

Lessons 5-1 & 5-2 HW Answers

p. 193/5-8 pp. 194-195/5, 7, 50 pp. 202-203/1, 2, 4, 11, 12, 14, 93

very important!

5. c. 6. b. 7. d. 8. a.

c=5 which is pos. so ↑ | c = -5 which is neg. so ↓ | c => neg so ↓ (cusp) | (2 cusps)

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5. Max. => x = b
Min. => x = c
EVT applies so max & min exist

7. Max. => x = c
No min => (not a closed interval)

50. B. Even function means symm. w.r.t. y-axis

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1. a. Yes (cont. & diff.)

b. $f'(x) = 2x + 2$

$f'(c) = 2c + 2 = \frac{f(1)-f(0)}{1-0}$

$2c + 2 = \frac{2-1}{1}$

$2c + 2 = 3$

$2c = 1$

$\boxed{c = \frac{1}{2}}$

$f'(\frac{1}{2}) = A_{ROC}$ from $[0, 1]$

2. a. Yes (cont. & diff.)

$f'(x) = \frac{2}{3}x^{-1/3}$

$f'(c) = \frac{2}{3\sqrt[3]{c}} = \frac{f(1)-f(0)}{1-0}$

$= \frac{2}{3\sqrt[3]{c}} = \frac{1-0}{1-0}$

$\frac{2}{3\sqrt[3]{c}} = 1$

$2 = 3\sqrt[3]{c}$

$(\frac{2}{3})^3 = (\sqrt[3]{c})^3$

$\boxed{c = \frac{8}{27}}$

4. $f(x) = |x-1|$

a. No => $|x-1|$ has a corner at x = 1 so it's not diff.

12. $A_{ROC} = \frac{212}{20} = 10.6°$ F/sec

MVT states that at some point $A_{ROC} = I_{ROC}$ so the rate must have been 10.6° f/sec at some point.

[FYI; If this problem had specified a rate < 10.6° F/sec, then IVT would need to be used, and could be used since f'(0) = 0.

Lessons 5-1 & 5-2 Extreme Values & the MVT HW Key

14. $A_{ROC} = \frac{26.2}{2.2} = 11.\overline{909}$ mph

The MVT states that the IROC of the runner was $11.\overline{909}$ mph at some point during the race. Since the initial velocity of the runner is zero (start & end race by standing), then the IVT says that the runner must have been running at 11 mph at least twice – once while getting to $11.\overline{909}$ mph from zero & once getting to zero from $11.\overline{909}$ mph.

43a. $a(t) = v'(t) = -1.6$ m/sec^2 ↓

So $v(t) = -1.6t + C$

$v(0) = 0$, so $C = 0$

$v(t) = -1.6t$

$v(30) = -1.6 * 30$

$= \boxed{-48 \text{ m/sec}}$

b. $v(t) = s'(t) = -1.6t$

So $s(t) = \frac{-1.6}{2}t^2 + C$

$= -.8t^2 + C$

$s(0) = 0$, so $C = 0$

$s(t) = -.8t^2$

$s(30) = -.8(30)^2$

$= -720$

$\boxed{720 \text{ meters down}}$

c, $v(0) = -4$ (use part a)

$-4 = -1.6(0) + C$

$C = -4$

$v(t) = -1.6t - 4$

$s(t) = -.8t^2 - 4t + C_2$

$s(0) = 0$, so $C_2 = 0$

$s(t) = -.8t^2 - 4t$

Depth is 720 m, so: $720 = -.8t^2 - 4t$

$0 = -.8t^2 - 4t - 720$

(solve w/calc.)

$\boxed{t \approx 27.604 \text{ sec to hit bottom}}$

$v(27.604) = \boxed{-48.166 \text{ m/sec}}$