AP Calculus AB

WS 88 - Motion Review

1) $s(t) = \int_0^t (3w^2 - 6w)\,dw$

a) $v(t) = 3t^2 - 6t$
$a(t) = 6t - 6$

b) $3t^2 - 6t = 0$
$3t(t-2) = 0$
$t = 0 \quad t = 2$

v: $+$ | 0 | $-$ | 2 | $+$

The particle moves in a pos. direction on $(-\infty, 0)$ & $(2, \infty)$ b/c $v(t) > 0$

c) $6t - 6 = 0$
$t = 1$

$a(t)$: $-$ | 1 | $+$

The particle is slowing down on $(-\infty, 0)$ & $(1, 2)$ b/c $v(t)$ & $a(t)$ have opp signs

4) $f(x) = 3x^5 - 20x^3$

$f'(x) = 15x^4 - 60x^2$
$f''(x) = 60x^3 - 120x = 0$
$6x(x^2 - 2) = 0$
$x = 0 \quad x = \pm\sqrt{2}$

f'': $-$ | $-\sqrt{2}$ | $+$ | 0 | $-$ | $\sqrt{2}$ | $+$

$f(x)$ is concave up on $(-\sqrt{2}, 0)$ & $(\sqrt{2}, \infty)$ b/c $f''(x) > 0$

B

2) $v(t) = t^2 \qquad t^2 = 0$ @ $t = 0$

$s(2) - s(1) = \int_1^2 t^2\,dt$

No Δ in direction in $(1, 2)$

$= \frac{1}{3}t^3 \Big|_1^2$

$= \frac{8}{3} - \frac{1}{3} = \boxed{3}$ C

3) $a(t) = 8 - 6t \qquad v(1) = 25$

$v(t) = 8t - 3t^2 + C$
$v(1) = 8 - 3 + C = 25$
$C = 20$

$v(t) = 8t - 3t^2 + 20$

$s(4) - s(2) = \int_2^4 (8t - 3t^2 + 20)\,dt$

$= \left[4t^2 - t^3 + 20t + C\right]\Big|_2^4$

$= [64 - 64 + 80] - [16 - 8 + 40]$

$80 - 48$

$\boxed{32}$ D

5) $a(t) = 3t + 2 \qquad v(1) = 4$
$s(1) = 6$

$v(t) = \frac{3}{2}t^2 + 2t + C$

$v(1) = \frac{3}{2} + 2 + C = 4$
$C = \frac{1}{2}$

$v(t) = \frac{3}{2}t^2 + 2t + \frac{1}{2}$

$s(t) = \frac{1}{2}t^3 + t^2 + \frac{1}{2}t + C$
$s(1) = \frac{1}{2} + 1 + \frac{1}{2} + C = 6$
$C = 4$

$s(t) = \frac{1}{2}t^3 + t^2 + \frac{1}{2}t + 4$

$s(2) = 4 + 4 + 1 + 4 = \underline{13}$ D

6) $f(x) = (x-2)(x-3)^2$

$f'(x) = (x-2)\cdot 2(x-3) + (x-3)^2$

$= (x-3)\left[2(x-2) + x-3\right]$

$= (x-3)(3x-7) \quad = 0$

$x = 3 \qquad x = \frac{7}{3}$

f': $+$ | $-$ | $+$

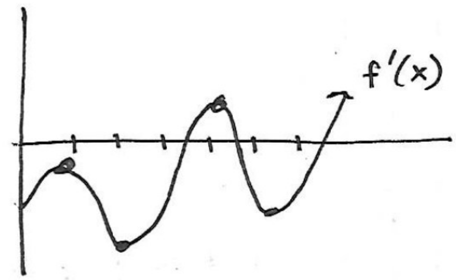
$\frac{7}{3} \qquad 3$

$f(x)$ has a max @ $x = \frac{7}{3}$
b/c $f'(x)$ Δs signs from
$+$ to $-$.

7) $f'(x) = x - 4e^{-\sin(2x)}$

Graph $f'(x)$

P.o.I. on $f(x)$
are max/min on $f'(x)$



(B) FOUR

8) $f(x) = (x^2 - 2x + 1)^{2/3}$

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

$f'(0) = \frac{2}{3}(1)(-2) = -\frac{4}{3}$

(D)