① $f(x) = -x^2 + 2x + 1$

$f' = -2x + 2 = 0$

$-2x = -2$

$x = 1$

x	$f(x) = -x^2+2x+1$	
0	$-0^2+2(0)+1$	1
1	$-1^2+2(1)+1$	2
4	$-4^2+2(4)+1$	-7

ABS. MAX IS 2 AT $x = 1$

ABSOLUTE MIN IS -7 AT $x=4$

② $f(x) = \frac{1}{3}x - 2x^{1/2}$

$f' = \frac{1}{3} - x^{-1/2} = 0$

$\frac{1}{3} = \frac{1}{\sqrt{x}}$

$\sqrt{x} = 3$

$x = 9$

x	$\frac{1}{3}x - 2\sqrt{x}$	$f(x)$
1	$\frac{1}{3}\cdot 1 - 2\sqrt{1}$	$-5/3$
9	$\frac{1}{3}\cdot 9 - 2\sqrt{9}$	-3
16	$\frac{1}{3}(16) - 2\sqrt{16}$	$-8/3$

ABS MAX IS $-5/3$ AT $x=1$

ABS MIN IS -3 AT $x=9$

ENDPOINTS $-3, 4$

③ $f' = 0$ AT $x = -1, 1, 3$

x	$2 + \int_1^x f'(x)\,dx$	$f(x)$
-3	$2 + \int_1^{-3} f'(x)\,dx$	$2+6-5=3$
-1	$2 + \int_1^{-1} f'(x)\,dx$	$2+6=8$
1	$f(1) = 2$	$2 = 2$
3	$2 + \int_1^3 f(x)\,dx$	$2+9=11$
4	$2 + \int_1^4 f(x)\,dx$	$2+9-3=8$

ABS MIN IS 2 AT $x=1$

ABS MAX IS 11 AT $x=3$

④ $f' = 0$ AT $x = 2, 4, 6$

ENDPOINTS 0, 6

x	$8 + \int_6^x f'(x)\,dx$	$f(x)$
0	$8 + \int_6^0 f'(x)\,dx$	$8+12-9+12=23$
2	$8 + \int_6^2 f'(x)\,dx$	$8+12-9=11$
4	$8 + \int_6^4 f'(x)\,dx$	$8+12=20$
6	$8 + \int_6^6 f'(x)\,dx$	$8+0=8$

ABS MAX IS 23 AT $x=0$

ABS MIN IS 8 AT $x=6$

⑤ $f' = 0$ AT $-1, 2$

ENDPOINTS AT $-3, 5$.

	$1 + \int_0^x f'(x)\,dx$	$f(x)$
-3	$1 + \int_0^{-3} f'(x)\,dx$	$1 - \frac{1}{2} + \frac{\pi}{2} = \frac{1}{2} + \frac{\pi}{2}$ OR $\frac{1+\pi}{2}$
-1	$1 + \int_0^{-1} f'(x)\,dx$	$1 - \frac{1}{2} = \frac{1}{2}$
2	$1 + \int_0^{2} f'(x)\,dx$	$1 + 2.5 = 3.5$
5	$1 + \int_0^{5} f'(x)\,dx$	$1 + 2.5 - 5 = -\frac{3}{2}$

ABS MAX IS 3.5 AT $X=2$

ABS MIN IS $-\frac{3}{2}$ AT $X=5$

⑥ A. $h(-2) = \int_2^{-2} f(t)\,dt = -3$

$h(4) = \int_2^{4} f(t)\,dt = -7.5$

B. $h'(2) = f(2) = -3$

$h'(4) = f(4) = -3$

C. h'' IS THE SLOPE OF f GRAPH!

h IS CC↑ ON $(-2, 0)$ AND $(4, 6)$ WHERE f IS <u>INCREASING</u>!

d. h' IS THE Y-VALUE OF f GRAPH

h IS INCREASING ON $(-2, 1)$ AND $(5, 7)$

WHERE f IS POSITIVE!

E. DECREASING → f IS NEGATIVE

CC↓ → f IS DECREASING

$\underline{(1, 2)}$

(F) $h' = f$ IS ZERO AT $x = 1, 5$.

ENDPTS ARE $-2, 7$.

x	$h(x) = \int_2^x f(x)\,dx$	$h(x)$
-2	$h(-2) = \int_2^{-2} f(x)\,dx$	-3
1	$h(1) = \int_2^1 f(x)\,dx$	1.5
5	$h(5) = \int_2^5 f(x)\,dx$	-7.5
7	$h(7) = \int_2^7 f(x)\,dx$	-3

ABS MAX IS 1.5 AT $x = 1$

ABS MIN IS -7.5 AT $x = 5$

(7) f' IS ZERO AT $-1, 4$.

ENDPTS ARE $-2, 7$.

x	$5 + \int_4^x f'(x)\,dx$	$f(x)$
-2	$5 + \int_4^{-2} f'(x)\,dx$	$5 + 7 - 1 = 11$
-1	$5 + \int_4^{-1} f'(x)\,dx$	$5 + 7 = 12$
4	$5 + \int_4^4 f'(x)\,dx$	5
5	$5 + \int_4^5 f'(x)\,dx$	$5 + 5.5 = \underline{\underline{10.5}}$

ABS MAX IS 12 AT $x = -1$

ABS MIN IS 5 AT $x = 4$

(8) A) $a(2) = \int_8^2 f(x)\,dx$

$= -3$

$a(3) = \int_8^3 f(x)\,dx$

$= -1.5$

B) $a'(2) = f(2) = 0$

$a'(5) = f(5) = -3$

c) $a''(2) = f'(2) = $ DNE! (SLOPES!)

$a''(4) = f'(4) = -3$

d) $a'(x) = f(x)$

$(0,4), (6,8) \rightarrow f$ IS POSITIVE!

E. $a'(x)$ IS ZERO AT $0, 2, 4, 6, 8$
$(f(x))$

ENDPOINTS ARE $0, 8$

x	$\int_8^x f(t)\,dt$	
0	$\int_8^0 f(t)\,dt$	-5
2	$\int_8^2 f(t)\,dt$	-3
4	$\int_8^4 f(t)\,dt$	0
6	$\int_8^6 f(t)\,dt$	-3
8	$\int_8^8 f(t)\,dt$	0

ABS MIN IS -8 AT $X=0$

ABS MAX IS 0 AT $X=8$ AND $X=4$.