

HW KEY for 4.9 Applications #1, 3, 5, 7a-e

① a) $0 \leq x \leq 10$

b) $y = -x^4 + 25x^3 - 150x^2$

$0 = -x^2(x^2 - 25x + 150)$
 $-x^2(x-15)(x-10)$

zeros: 0, 0, 15, 10

The zeros at 0 and 10 means the beam is not deflected since those are the support points.

The zero at 15 is out of the domain and meaningless.

③ a) Key: $V(T) = -T^3 + 9T^2 - 24T + 70$ → factors: $(x-7)$
 $(x-1+3i)$
 $(x-1-3i)$

b) $0^\circ \rightarrow 70$ units
 $500^\circ \rightarrow 50$ units
 $600^\circ \rightarrow 34$ units

d) No. Within domain $0 \leq T \leq 6$, V never equals zero. $V=0$ when $T=7$, $T=1 \pm 3i$
 ↑ not real #'s out of domain.

⑤ a) $P(x) = 10x^3 + 8x^2 - 5x - 3$

b) 1,422 board-feet.

c) $b: \pm 1, \pm 3$
 $a: \pm 1, \pm 2, \pm 5, \pm 10$

$\frac{b}{a}: \pm 1, \pm \frac{1}{2}, \pm \frac{1}{5}, \pm 10, \pm 3, \pm \frac{3}{2}, \pm \frac{3}{5}, \pm \frac{3}{10}$

$P(-1) = 0 \rightarrow (x+1)$ is a factor.

-1	10	8	-5	-3
		-10	2	3
	10	-2	-3	0

$10x^2 - 2x - 3$

$a=10, b=-2, c=-3$

$x = \frac{2 \pm \sqrt{4 - 4(10)(-3)}}{20}$

$\frac{2 \pm \sqrt{124}}{20}$	Zeros
$\approx 0.65677\dots$	
$\approx -0.45677\dots$	

c) (-1) is the integer zero.

e) .7 of a foot ≈ 8 inches diameter

f) At least $2\frac{1}{2}$ feet.
 - use the graph

$$\textcircled{7} \quad S_n = 0^2 + 1^2 + 2^2 + \dots + n^2$$

$$a) \quad S(0) = 0$$

$$S(1) = 1$$

$$S(2) = 5$$

$$S(3) = 14$$

$$b) \quad S(n) = \frac{1}{3}n^3 + \frac{1}{2}n^2 + \frac{1}{6}n$$

$$c) \quad S(n) = \frac{n}{6}(2n+1)(n+1)$$

$$d) \quad S(4) = \frac{4}{6}(2(4)+1)(4+1) \quad S(4) = 0^2 + 1^2 + 2^2 + 3^2 + 4^2$$
$$= \frac{2}{3}(9)(5) \quad = 30$$
$$= 30$$

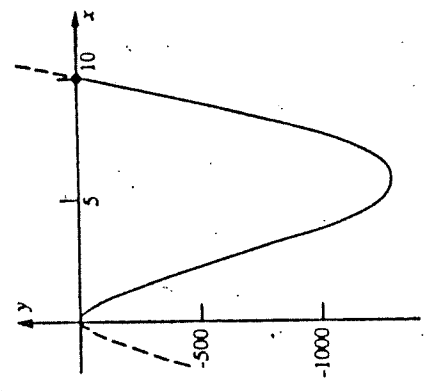
$$S(5) = \frac{5}{6}(10+1)(5+1) \quad S(5) = 0^2 + 1^2 + 2^2 + 3^2 + 4^2 + 5^2$$
$$= \frac{5}{6}(11)(6) \quad = 55$$
$$= 55$$

$$e) \quad S(1000) = \frac{1000}{6}(2 \cdot 1000 + 1)(1000 + 1)$$
$$= \frac{667000}{2} \cdot (1001)$$
$$= 333\,833\,500$$

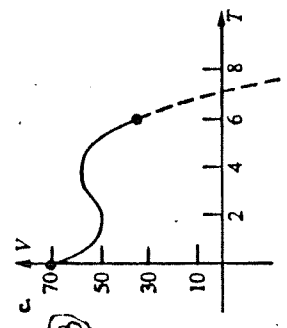
①

x	y
0	0
1	-126
2	-416
3	-756
4	-1056
5	-1250
6	-1296
7	-1176
8	-896
9	-486
10	0

Note: Actual minimum is at $x \approx 5.7846$, and $y \approx -1299.87$.



③



⑤

