3. Area of print = $(x)(y) = 60in^2 \quad \Rightarrow y = \frac{60}{x}$

Area of page = $(x+2)(y+3) \Rightarrow (x+2)(\frac{60}{x}+3) \Rightarrow 66 + 3x + \frac{120}{x}$

$\frac{dArea}{dx} = 3 - \frac{120}{x^2} \quad \Rightarrow 3 - \frac{120}{x^2} = 0$ when $x = 2\sqrt{10} \approx 6.325$

$y = \frac{60}{2\sqrt{10}} \approx 9.489$

4. Volume$=\pi r^2 h = 22 \quad \Rightarrow h = \frac{22}{\pi r^2}$

a) SA = $2\pi r^2 + 2\pi rh$

b) C= $2\pi r^2(2k) + 2\pi rh(k) = 4k\pi r^2 + 2k\pi rh$, k = constant

c) C = $4k\pi r^2 + \frac{44k}{r}$

d) $\frac{dC}{dr} = 8k\pi r - \frac{44k}{r^2} \quad 8k\pi r - \frac{44k}{r^2} = 0$ when $8k\pi r = \frac{44k}{r^2} \Rightarrow r^3 = \frac{11}{2\pi} \quad r = \sqrt[3]{\frac{11}{2\pi}} \approx 1.20523$

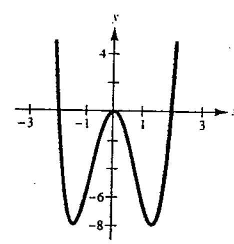
5. $f(x)$ is EVEN $\quad f(0) = 0$

$f(x) = 2x^2(x+2)(x-2) = 0$ when $x = 0, \pm 2$

$f'(x) = 8x^3 - 16x = 8x(x+\sqrt{2})(x-\sqrt{2})$

$f''(x) = 24x^2 - 16$

x	$f(x)$	$f'(x)$	$f''(x)$	Conclusion
-2	0	-32	80	decreasing , concave up
$-\sqrt{2}$	-8	0	32	relative min
$\frac{-\sqrt{6}}{3}$	-4.444	8.7093	0	Point of Inflection
0	0	0	-16	relative max
$\frac{\sqrt{6}}{3}$	-4.444	-8.7093	0	Point of Inflection
$\sqrt{2}$	-8	0	32	relative min
2	0	32	80	Increasing, concave up



6. P = xy $\quad$ x + 5y = 80 $\quad \Rightarrow x = (80-5y)$ $\quad$ domain $0 \le y \le 16$

P = $(80-5y)y \quad \Rightarrow 80y - 5y^2$

$\frac{dP}{dy} = 80 - 10y = 0$ when $y = 8 \quad x = 80 - 5(8) = 40$

7.
$f'(x)=4x^3-18x^2$

$f''(x)=12x^2-36x \Rightarrow 12x(x-3)=0$ when $x=0,3$

X	$f(x)$	$f'(x)$	$f''(x)$
$(-\infty,0)$			+
0	0	0	0
$(0,3)$			-
3	-81	-54	0
$(3,\infty)$			+

8.
$f'(x)=3(x+2)^2(x-1)^4+4(x-1)^3(x+2)^3=\{(x+2)^2(x-1)^3\}\{3(x-1)+4(x+2)\}=(x+2)^2(x-1)^3(7x+5)$

$(x+2)^2(x-1)^3(7x+5)=0$ when $x=-2,1,\frac{-5}{7}$ Therefore, these are our critical points.

9.
$\lim_{x\to\infty}\frac{4x}{\sqrt{x^2+9}}=4$ $\lim_{x\to-\infty}\frac{4x}{\sqrt{x^2+9}}=-4$ Therefore, horizontal asymptotes are $y=\pm 4$

10.
$V=x(6-2x)^2$ $D_V: 0<x<3$

$\frac{dV}{dx}=(1)(6-2x)^2+2(6-2x)(-2)(x)=(6-2x)(6-2x-4x)=(6-2x)(6-6x)$

$(6-2x)(6-6x)=0$ when $x=3,1$ Notice, only 1 is in our domain.

11.
Possible Rational Zeros are –2, -1, 1, 2. Use synthetic division.

```
1 | 1  0  -3  2
  |    1   1 -2
    1  1  -2  0
```

Thus, $x^3-3x+2=(x-1)(x^2+x-2) \Rightarrow (x-1)^2(x+2)$

Zeros, x = -2, 1 $f(0)=2$

$f'(x)=3x^2-3=3(x+1)(x-1)$ Critical points x = -1, 1

$f''(x)=6x$ 6x = 0 when x = 0

X	$f(x)$	$f'(x)$	$f''(x)$	conclusion
-2	0	9	-12	Zero, increasing, concave down
-1	4	0	-6	relative max
0	2	-3	0	point of inflection
1	0	0	6	Relative min