

2nd derivative Test HW

1/18/17

p 236 2, 5, 8

p 246 1, 3

② $f(x) = -x^4 + 4x^3$
 $f'(x) = -4x^3 + 12x^2$
 $f''(x) = -12x^2 + 24x$

$0 = -12x^2 + 24x$

$0 = -12x(x-2)$

$x=0 \quad | \quad x=2$

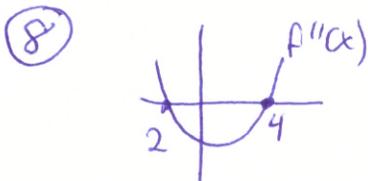
$f(0) = 0 \quad | \quad f(2) = 16$

∴ inflection points occur (inflexion) at (0,0) and (2,16)

x	-1	0	1	2	3
f'(x)	-36	0	12	0	-36
shape	∩	IP	U	IP	∩

Concave down $(-\infty, 0) \cup (2, \infty)$

Concave up $(0, 2)$



- so IP's on f(x) occur when $x=2$ and $x=4$
- Concave up when $f''(x)$ is positive $(-\infty, 2) \cup (4, \infty)$
- Concave down $(2, 4)$

⑤ $f(x) = 2xe^x$
 $f'(x) = (2x)(e^x) + (e^x)(2)$
 $f'(x) = 2e^x(x+1)$

$f''(x) = (2e^x)(1) + (x+1)(2e^x)$

$f''(x) = 2e^x(1+x+1)$

$f''(x) = 2e^x(x+2)$

$0 = 2e^x(x+2)$

$2e^x = 0 \quad | \quad x+2 = 0$

$e^x = 0 \quad | \quad x = -2$

(no soln) $f(-2) = -4e^{-4}$

≈ -0.733

(3sf)

∴ one IP at $(-2, -4e^{-4})$

$\approx (-2, -0.733)$

(3sf)

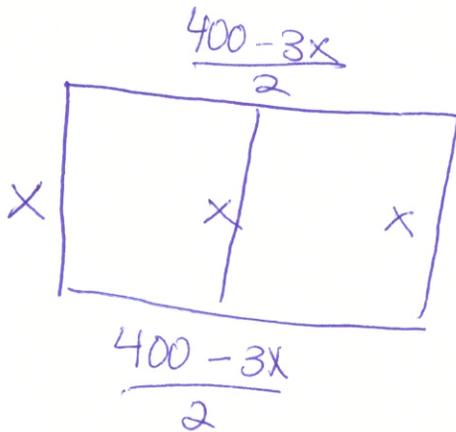
x	-2	-2	0
f'(x)	-0.994	0	4
shape	∩	IP	U

Concave down $(-\infty, -2)$

Concave up $(-2, \infty)$

7246

(3)



$$\text{Area} = x \left(\frac{400-3x}{2} \right)$$

$$A(x) = \frac{400x - 3x^2}{2}$$

$$A(x) = 200x - \frac{3}{2}x^2$$

$$A'(x) = 200 - 3x$$

$$0 = 200 - 3x$$

$$3x = 200$$

$$x = \frac{200}{3}$$

$$x = 66 \frac{2}{3}$$

→

show this gets you a max rather than a min using 2nd derivative value

$$A''(x) = -3$$

$$A''(66 \frac{2}{3}) = -3$$

∴ concave down and max occurs when $x = 66 \frac{2}{3}$

Max area

$$A(66 \frac{2}{3}) \approx 6666.6$$

$$\boxed{\text{or } 6670 \text{ (3sf)}}$$