$f(x) = x^2$

$f'(x) = 2x$

CV: $x = 0$

$(-5, -2]$

$-\ |\ +$ (0)

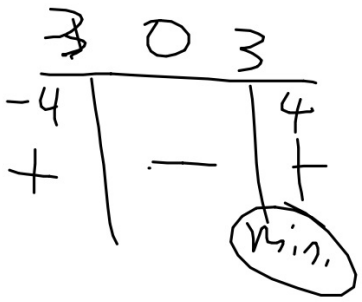
5) B

$f''(a) > 0$.

6) $(0)^3 = (\sqrt[3]{x^2-9})^3$

$0 = x^2 - 9$

$x = \pm 3.$



7) $0 = |x+2|(x-4)$

$(x)(\cos^2 x) = 0$

$x = 0,$

$\cos^2 x = 0$

$(\cos x)^2$

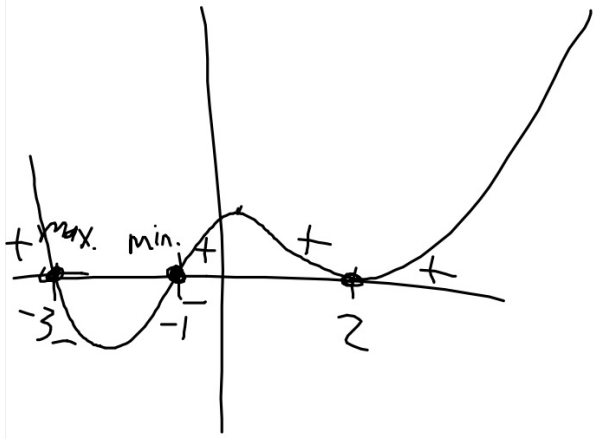
$\cos x = 0$

$\pi/2, -\pi/2.$

9) $y = \frac{3}{x} = 3x^{-1}$

$dy = -3x^{-2} = \frac{-3}{x^2}\, dx.$

(10a)



11) $x^2 - xy + y^2 = 19 \quad (-2, 3)$

$\frac{d}{dx} = 2x - (y + xy') + 2yy' = 0$

$2x - y - xy' + 2yy' = 0$

$+xy' - 2yy'$

$2x - y = xy' - 2yy'$

$\frac{2x - y}{x - 2y} = \frac{y'(x - 2y)}{x - 2y}$

$m = \frac{2(-2) - 3}{-2 - 2(3)} = \frac{-7}{-8} = \frac{7}{8}$

$y - 3 = \frac{7}{8}(x + 2)$

b) $f(x) + f'(x)\,dx$. $\Delta x = 0.168$

$3 + \frac{7}{8}(-0.168)$

c) $y' = \frac{2x-y}{x-2y}$ f. $(-2,3)$

$$y'' = \frac{(2-y')(x-2y) - (1-2y')(2x-y)}{-(x-2y)^2}$$

$$= \frac{\left(2-\frac{7}{8}\right)(-2-6) - \left(1-\frac{14}{8}\right)(-4-3)}{+(-2-6)^2} \quad \frac{+}{+} = \ominus$$

CV Down.

Under estimation.

12) Wire = 12m. ← perimeter + circumference.
minimize area = $s^2 + \pi r^2$

$x_m \rightarrow$ circle.

$12-x \rightarrow$ square

$x = 2\pi r \Rightarrow r = \frac{x}{2\pi}$

$12-x = 4s \Rightarrow s = \frac{12-x}{4} = 3-\frac{1}{4}x$

$r = \frac{6}{\frac{\pi+4}{2\pi}} = \frac{6}{\pi+4}$

$A(x) = (3-\frac{1}{4}x)^2 + \pi\left(\frac{x}{2\pi}\right)^2$ ($\frac{x^2}{4\pi^2}$)

$= (3-\frac{1}{4}x)^2 + \frac{x^2}{4\pi}$ ($\frac{1}{4\pi}x^2$)

$A'(x) = 2(3-\frac{1}{4}x)\cdot\frac{-1}{4} + \frac{1}{2\pi}x$

CV: (-2π) $0 = \left(\frac{-1}{2}(3-\frac{1}{4}x) + \frac{1}{2\pi}x\right)-2\pi$

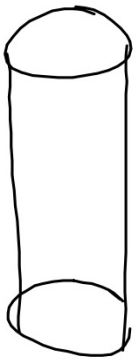
$0 = \pi(3-\frac{1}{4}x) - x$

$0 = 3\pi - \frac{\pi}{4}x - x \Rightarrow -3\pi = \frac{-\pi-4}{4}x$

$\frac{-12\pi}{-\pi-4} = x$

$\frac{12\pi}{\pi+4} = x$

Bonus:



$V = \pi r^2 h$

$1 = \pi r^2 h$

$h = \frac{1}{\pi r^2}$

$SA = 2\pi r^2 + 2\pi rh.$

$h = \frac{1}{\pi\left(\left(\frac{1}{4\pi}\right)^{1/3}\right)^2} = \frac{1}{\pi\left(\frac{1}{4\pi}\right)^{2/3}}$

← Top & Bottom twice as much.

$Cost = 4\pi r^2 + 2\pi rh$

$= 4\pi r^2 + 2\pi r\left(\frac{1}{\pi r^2}\right)$

$= 4\pi r^2 + \frac{2}{r}$ ⇝ $2r^{-1}$

$Cost' = 8\pi r - 2r^{-2} = 8\pi r - \frac{2}{r^2}$

CV: $0 = \frac{8\pi r^3 - 2}{r^2}$ (r^2)

$0 = 8\pi r^3 - 2$

$\frac{1}{4\pi} = \pi r^3$

$\sqrt[3]{\frac{1}{4\pi}} = r$