MTH 1125 (1 pm) Test #3

Fall 2018

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Show CLEARLY how you arrive at your answers.

1. $f(x) = 2x^3 - 3x^2 - 36x + 1$. [1]Identify the intervals on which $f(x)$ is increasing/decreasing, and [2]identify all relative maximums and minimums.

2. $f(x) = \frac{3}{22}x^{\frac{11}{3}} - \frac{24}{5}x^{\frac{5}{3}} + 4x + 2$. [1]Identify the intervals on which $f(x)$ is concave up/concave down, and [2]identify all points of inflection

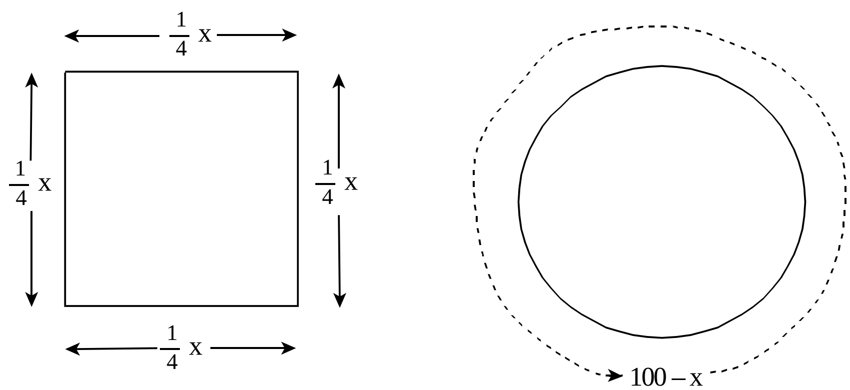
3. $f(x) = 4x^3 + 3x^2 - 6x + 2$ on the interval $[-2, 0]$. Find the absolute maximum value and absolute minimum value of $f(x)$.

4. Farmer Joe has 100 yards of fencing. He will use some of the fencing to construct a square pen and he will use the rest of the fencing to construct a circular pen. How much fencing should he use to construct each if he wants the total enclosed area to be as large as possible?

Let x be the amount of fencing that he will use on the square pen

Then $(100 - x)$ is the amount of fencing that he will use on the circular pen

Then the circumference of the circular pen will be $C = 2\pi r = 100 - x$



Let A be the total area enclosed.

Then $A =$ (area of the square) + (area of the circle) $= \left(\frac{x}{4}\right)^2 + \pi r^2$

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

We need to know what r is in terms of x

Recall that the circumference is $C = 2\pi r = 100 - x$

$\Rightarrow 2\pi r = 100 - x$

$\Rightarrow r = \frac{100-x}{2\pi}$

Thus, Area is given by:

$A(x) = \left(\frac{x}{4}\right)^2 + \pi r^2 = \left(\frac{x}{4}\right)^2 + \pi \left(\frac{100-x}{2\pi}\right)^2 = \frac{x^2}{16} + \frac{1}{4\pi}(100 - x)^2$
i.e., $A(x) = \frac{x^2}{16} + \frac{1}{4\pi}(100 - x)^2$

Again, we want to find out: How much fencing should be used to construct each pen, if the total enclosed area to be as large as possible?

(Use $\pi = \frac{22}{7}$ in your final calculations)