Math 31 Applications of Derivatives – Quiz 1 (2019)

In order to receive full marks for the questions, you must show all pertinent work.

- 1. Solve **one** of the two problems:
 - A rectangular box, with two square ends has a total surface area of $150 \ cm^2$. Find the dimensions of the box if it is to have a maximum volume.
 - Find the points on $y = x^2 3$ that are closest to the point P(0,2).

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

2. You are given a sphere with a radius 12 cm. You want to inscribe the largest cone **or** largest cylinder in your sphere. Find the exact radius and height of your maximum inscribed shape.

 $V_{cone} = \frac{1}{3}\pi r^2 h \quad V_{sphere} = \frac{4}{3}\pi r^3 \quad V_{cylinder} = \pi r^2 h$



displacement as a function of time = s(t)velocity: $v(t) = \frac{d}{dt}(s) = \frac{ds}{dt} = s'(t)$ acceleration = $\frac{d}{dt}(v) = \frac{dv}{dt} = \frac{d}{dt}\left(\frac{d}{dt}(s)\right) = s''(t)$

- 3. A particle is travelling on a horizontal line according to $s(t) = \frac{1}{3}t^3 5t^2$. At a time of 6.0 seconds determine if the particle is:
 - a) moving away or towards the origin.
 - b) slowing down or speeding up at that time.

Name: _____