

Let's Sing!

Chorus for "Maxima and Minima"

[Don't forget to make nice signs for extra credit next semester]

Saddle, peak, and trough and

Saddle, peak and trough and

***Saddle, peak and trough and peak and trough
and peak and trough and***

Saddle, peak, and trough and

Saddle, peak, and trough and

***Saddle, saddle, peak and trough and peak and
trough.***

Chorus for "Physics Extravaganza"

***[Note: There are two different versions so
listen before you start singing]***

Repeat 3 times:

Acceleration's rate of change is impulse also known as jerk

OR

Acceleration's rate of change is surge, or lurch, or jolt, or jerk

Now let's finish the Pool Problem

We desire $V'(8)$ AND $\frac{dh}{dt}$ at time $t = 8$

$$V(t) = 1000 + \int_0^t P(x) dx - \int_0^t R(x) dx$$

INITIAL Amt + Amt ADDED - Amt LEAKED

$$V'(t) = P(t) - R(t)$$

$$V'(8) = P(8) - R(8)$$

$$V'(8) = 43.241 \text{ or } 43.242 \frac{ft^3}{hr}$$

$$V = \pi r^2 h$$

$$\frac{d}{dt} V = \frac{d}{dt} \pi r^2 h$$

$$V'(t) = \frac{dV}{dt}$$

$$\frac{dV}{dt} = \pi \left[\cancel{2r h \frac{dr}{dt}} + r^2 \frac{dh}{dt} \right]$$

$$\frac{dr}{dt} = 0$$

$$\frac{dV}{dt} = \pi r^2 \frac{dh}{dt}$$

at time $t = 8$

$$V'(8) = 144\pi \frac{dh}{dt}$$

$$.095 \text{ or } \approx \frac{dh}{dt}$$

$$.096 \frac{\text{ft}}{\text{hr}}$$

Particle Motion Problems [Again]

A particle moves along the x -axis so that its velocity, in inches per second, for time $0 \leq t \leq 10$ seconds is given by the function $v(t) = 2t \sin(t)$. The position of the particle at time $t = 3$ is 7 inches.

$$X(3) = 7 \text{ inches}$$

INITIAL VALUE

$$v(t) = X'(t)$$

(a) Find the total distance traveled by the particle during the interval $0 \leq t \leq 10$. Use correct units.

$$\begin{aligned} \text{TDT}_{\text{on } [0,10]} &= \int_0^{10} |v(t)| dt \\ &\approx 59.70483922 \text{ in.} \end{aligned}$$

(b) Find the position of the particle at $t=7$

$$\begin{aligned} x(7) &= x(3) + \int_3^7 v(t) dt \\ x(7) &\approx -8.462853359 \text{ in} \end{aligned}$$

(c) Write the equation of the line tangent to the graph of the position function, $x(t)$ at time $t=3$ and find an approximation for $x(2.9)$ using local linearization.

$$\begin{aligned} \text{Point: } &(3, 7) \\ \text{Slope: } &x'(3) = v(3) \approx .84672 \end{aligned}$$

$$y - 7 = 0.84672(x - 3)$$

$$\text{let } t = 2.9$$

$$y - 7 = 0.84672(2.9 - 3)$$

$$x(2.9) \approx 6.915327995 \text{ inches}$$

(d) Find the acceleration of the particle at $t = 3$.

Use correct units.

$$a(t) = v'(t)$$

$$v(t) = \underline{2t} \underline{\sin t}$$

$$a(t) = 2 \sin t + 2t \cos t$$

$$a(3) \approx -5.657714115 \frac{\text{in.}}{\text{sec}^2}$$