Warm Up $f(x)=\dfrac{x-6}{x^2+2}$

a. Find f'(x)

3.4 Rates of Change

b. Find the slope of the tangent line at x=2

c. Find the equation of the tangent line at x=2

d. Find the equation of the normal line at x=2

Use $f(x)=x^3-2x^2-4x+2$ to find each of the following

a. f'(x) b. f '(0) c. f '(1)

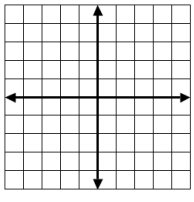
d. f '(2) e. f '(3)

Particle Motion: Analyzing motion along a line is a common application of derivatives in physics. It is a great example of one of the many reasons for studying Calculus. We use calculus to describe (in detail) the motion of any object along a line

What questions might you ask about the motion of an object along a line?

f. Write a description of the graph of f(x) using only the derivatives above

g. Given f(0)=2 draw a rough sketch of f(x)



3.4

Definitions:

Position:

Displacement:

Average Velocity:

Instantaneous Velocity:

Speed:

Acceleration:

Turning Point:

A particle moves along a line so that it's position at any time t seconds is given by the function $s(t) = t^3 - 2t^2 - 4t + 2$ in feet.

a. Find the average velocity from $0 \le t \le 3$

b. What is the instantaneous velocity at t=3 seconds?

c. What is the acceleration at t=3 seconds?

d. What is the speed at t=1 second?

e. Find the displacement after 3 seconds

f. At what time t does the particle change direction?

The equation for free fall on Mars is $s(t) = 1.86t^2$ meters with t in seconds. How long would it take a rock falling from rest to reach a velocity of 20 m/s (about 45 mph)?

The equation for free fall on Jupiter is $s(t) = 11.44t^2$ meters with t in seconds. How long would it take a rock falling from rest to reach a velocity of 20 m/s (about 45 mph)?

3.4

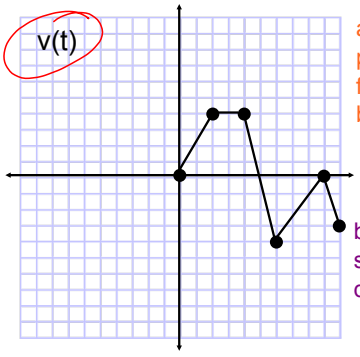
Helpful Info:

Moving Forward:

Moving Backward:

Speeding Up:

Slowing down:



a) When is the particle moving forward? backward?

b) when is the particle speeding up? slowing down? stopped?

c) When is the particle's acceleration positive? Negative?

d) When is the particle speeding up? Slowing down?

e) When does the particle move at its greatest speed?