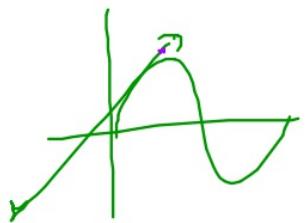


Approximate $\sin 46^\circ$



$$y = \sin x \quad \begin{matrix} \sin 45 \\ (45, \frac{\sqrt{2}}{2}) \end{matrix}$$

$$y - y_1 = m(x - x_1)$$

$$y - \frac{\sqrt{2}}{2} = \textcircled{m}(x - 45^\circ)$$

$$y - \frac{\sqrt{2}}{2} = \frac{\sqrt{2}}{2} (x - 45)$$

$$y - \frac{\sqrt{2}}{2} = \frac{\sqrt{2}}{2} (1) \rightarrow y = \underline{\sqrt{2}}$$

$$y' = \cos x$$

$$y'(45^\circ) = \cos(45^\circ)$$

$$\frac{\sqrt{2}}{2}$$

Good afternoon; no warm up, check hw answers:

2. $y = 3 - 7x^3 + 3x^7 - 21x^2 + 21x^6$

4. $y = \frac{2x+1}{2x-1} - \frac{4}{(2x-1)^2}$

6. $s = \cot \frac{2}{t} \frac{2}{t^2} \csc^2 \frac{2}{t}$

8. $y = x\sqrt{2x+1} \frac{3x+1}{\sqrt{2x+1}}$

10. $r = \tan^2(3 - \theta^2)$
 $-4\theta \tan(3 - \theta^2) \sec^2(3 - \theta^2)$

$$-\frac{2+2t^2}{1+4t^2} + 2t \cot^{-1} 2t$$

12. $y = \ln \sqrt{x} \frac{1}{2x}, x > 0$

14. $y = xe^{-x} - xe^{-x} + e^{-x}$

16. $y = \ln(\sin x) \cot x$

18. $r = \log_2(\theta^2) \frac{2}{\theta \ln 2}$

20. $s = 8^{-t} - 8^{-t} \ln 8 \frac{(2 \cdot 2^t)[x^3 \ln 2 + x \ln 2 + 1]}{(x^2 + 1)^{3/2}} \text{ or}$

22. $y = \frac{(2x)2^x}{\sqrt{x^2 + 1}}$ 

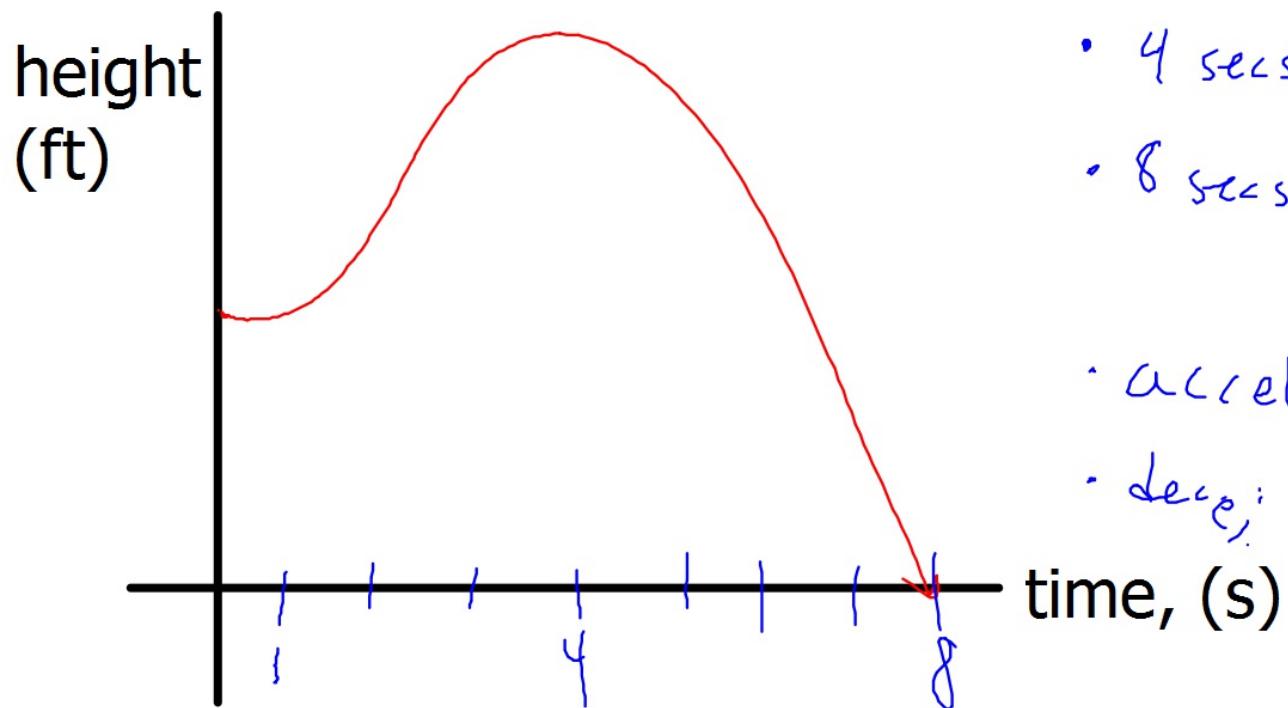
24. $y = \sin^{-1}\sqrt{1-u^2} \frac{(2x)2^x}{\sqrt{x^2 + 1}} \left(\frac{1}{x} + \ln 2 - \frac{x}{x^2 + 1} \right)$ 

26. $y = (1+t^2) \cot^{-1} 2t \frac{-u}{\sqrt{u^2 - u^4}} = -\frac{u}{|u|\sqrt{1-u^2}}$

28. $y = 2\sqrt{x-1} \csc^{-1}\sqrt{x} \frac{-1}{x} + \frac{\csc^{-1}\sqrt{x}}{\sqrt{x-1}}$

Position-Velocity-Acceleration

(notes)



- 4 secs: object is still
- 8 secs: velocity is fastest.
- accelerating: 4-8 sec
- dec_e: 1-4 sec.

How do we talk about "where" something is (position)?

What unit?

distance (miles, ft, km, ...)

$s(t)$

What units do we talk about speed in?

$\frac{\text{distance}}{\text{time}}$ (ft/s, cm/s, m/h...)

How do we describe acceleration?

$$\frac{\frac{\text{distance}}{\text{time}}}{\text{time}} \rightarrow \frac{\frac{1}{t} \cdot \frac{1}{t}}{\underline{\underline{t}}} \rightarrow \frac{\underline{\underline{1}}}{t^2}$$

$$s'(t) = \frac{ds}{dt} = v(t)$$

$$s''(t) = \frac{d^2 s}{dt^2} = a(t) \\ = v'(t)$$

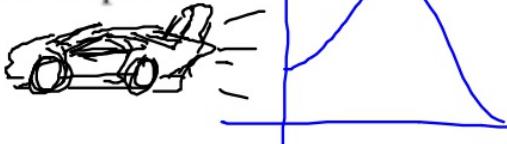
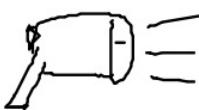


"Higher Order Derivatives": 2nd derivative, 3rd derivative, etc.

Notation:

Function	Derivative	2nd Deriv.	3rd Deriv.	
y	y'	y''	y'''	$y^{(3)}$
$f(x)$	$f'(x)$	$f''(x)$	$f^{(3)}(x)$	
y	$\frac{dy}{dx}$	$\frac{d^2y}{dx^2}$	$\frac{d^3y}{dx^3}$	

A stone is thrown upwards from the top of a cliff so that its position relative to ground level is given by



$$\begin{aligned}x(t) &= 0 = 5(-t^2 + 4t + 5) \\&= -5(t^2 - 4t - 5) \\&= -(t - 5)(t + 1)\end{aligned}$$

$$\underline{x(t) = 20t - 5t^2 + 25}$$

$$v(t) = 20 - 10t$$

$$a(t) = -10 \text{ m/s}^2$$

where t is measured in seconds and x is measured in metres. The positive direction for position is upwards.

a) Find the height of the cliff above ground level. $x(0) = 25 \text{ m}$

b) Find the maximum height above ground level attained by the stone.

$$\begin{cases} v(t) = 0 \\ 20 - 10t = 0 \end{cases}$$

c) Find the velocity after 1 second. $v(1) = 10 \text{ m/s}$

d) Find the velocity when the stone hits the ground.

$$v(5) = 20 - 10(5)$$

$\Rightarrow -30 \text{ m/s}$

e) Is the acceleration constant or not? $a(t) = -10$ Yes.

$$\boxed{t = 5} \quad \boxed{-1}$$

$$\begin{array}{l} x(2) = 45 \text{ m} \\ \boxed{45 \text{ m}} \end{array}$$

Wksht:

#18-24

→ "at rest" $v(t) = 0$

→ "changing direction" $\Rightarrow v(t) = 0$