

12:6

$$\frac{d}{dx} (x^{\sin x})$$

$$y = x^{\sin x}$$

$$\ln y = \ln x^{\sin x}$$

$$\ln y = \sin x \ln x$$

$$\frac{1}{y} \frac{dy}{dx} = \sin x \cdot \frac{1}{x} + \ln x \cdot \cos x$$

$$\frac{dy}{dx} = x^{\sin x} \left[\frac{\sin x}{x} + \ln x \cos x \right]$$

12:10

$$7 \ln(x^2 y^2) = 6$$

$$7 \ln x^2 + 7 \ln y^2 = 6$$

$$14 \ln x + 14 \ln y = 6$$

$$\frac{14}{x} + \frac{14}{y} \frac{dy}{dx} = 0$$

$$\frac{\cancel{y}}{14} \cdot \frac{\cancel{14}}{\cancel{y}} \frac{dy}{dx} = \frac{-14}{x} \cdot \frac{\cancel{y}}{\cancel{14}}$$

$$\frac{dy}{dx} = -\frac{y}{x}$$

12:5

$$\frac{d}{dx} \left(\frac{(x+1)^2}{\sqrt{x^2+1}} \right)$$

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

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

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

$$\frac{1}{y} \frac{dy}{dx} = \frac{2}{x+1} - \frac{1}{x} \cdot \frac{1}{x^2+1} \cdot 2x$$

$$\frac{1}{y} \frac{dy}{dx} = \frac{2}{x+1} - \frac{x}{x^2+1}$$

$$\frac{dy}{y} = \frac{(x+1)^2}{\sqrt{x^2+1}} \left[\frac{2}{x+1} - \frac{x}{x^2+1} \right]$$

13:3

$$h(t) = -5t^2 + 4t + 2$$

When does it reach its peak?

$$v(t) = h'(t) = -10t + 4$$

$$0 = -10t + 4$$

$$10t = 4$$

$$t = \frac{2}{5} \text{ sec}$$

what is height at peak?

$$h\left(\frac{2}{5}\right) = -5\left(\frac{2}{5}\right)^2 + 4\left(\frac{2}{5}\right) + 2$$

$$= -5\left(\frac{4}{25}\right) + \frac{8}{5} + \frac{10}{5}$$

$$= -\frac{4}{5} + \frac{8}{5} + \frac{10}{5} = \frac{14}{5} \text{ m}$$

13.1

$$s(t) = 8t^2 + 64t + 6$$

$$v(t) = s'(t) = 16t + 64$$

total distance bt $t = -8$ and $t = 0$

$$s(-8) = 6$$

$$s(0) = 6$$

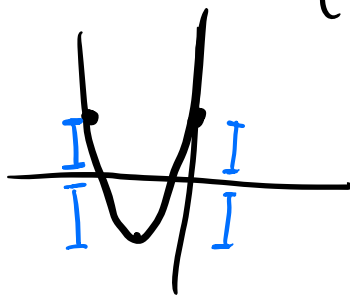
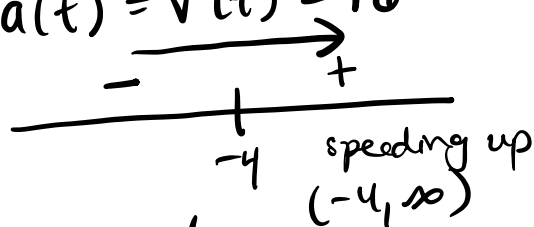
$$s(-4) = -122$$

$$0 = 16t + 64$$

$$16t = -64$$

$$t = -4$$

$$a(t) = v'(t) = 16$$



$$d = 6 + 122 + 122 + 6$$

$$= 256$$

12:4

$$\frac{d}{dx} \left(\frac{-2\cos x}{\ln x} \right) = \frac{\ln x \cdot 2\sin x + 2\cos x \cdot \frac{1}{x}}{\ln^2 x}$$
$$= \frac{2\sin x \cdot \ln x + \frac{2}{x} \cos x}{\ln^2 x}$$

12:7

$$\frac{d}{dx} \left(\sqrt{\frac{x-1}{x+1}} \right) \quad y = \sqrt{\frac{x-1}{x+1}}$$

$$\ln y = \ln \left(\frac{x-1}{x+1} \right)^{\frac{1}{2}}$$

$$\ln y = \frac{1}{2} \ln \frac{x-1}{x+1}$$

$$\ln y = \frac{1}{2} \ln(x-1) - \frac{1}{2} \ln(x+1)$$

$$\frac{1}{y} \frac{dy}{dx} = \frac{1}{2(x-1)} - \frac{1}{2(x+1)}$$

$$\frac{dy}{dx} = \sqrt{\frac{x-1}{x+1}} \left[\frac{1}{2(x-1)} - \frac{1}{2(x+1)} \right]$$

13.2

$$s(t) = 9t^2 - 90t + 4$$

$$v(t) = 18t - 90$$

$$s(0) = 4$$

$$s(9) = -77$$

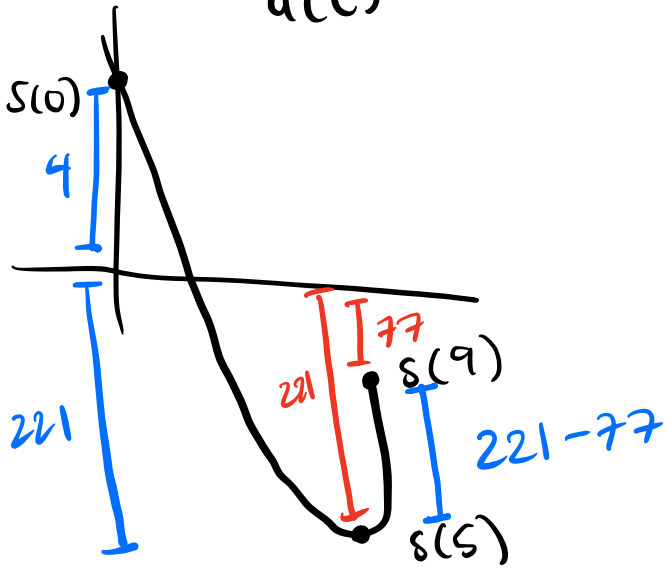
$$a(t) = 18$$

$$0 = 18t - 90$$

$$18t = 90$$

$$t = 5$$

$$s(5) = -221$$



$$d = 4 + 221 + (221 - 77) = 369$$

