6b $\frac{d}{dx}\left[x \sin(2y) = y\cos(2x)\right]$ $\frac{d}{dx}\left[\quad\right]$

$$1\sin(2y) + x(2\cos(2y))y' = y'\cos(2x) + y(-\sin(2x))(2)$$

$$\vdots$$

$$y' = \frac{-\sin(2y) - 2y\sin(2x)}{2x\cos(2y) - \cos(2x)}$$

wrong on solutions.

6c $y'\Big|_{(\frac{\pi}{4},\frac{\pi}{2})=(x,y)} = 2$ wrong on sol'ns

$$\Rightarrow L(x) = 2(x - \tfrac{\pi}{4}) + \tfrac{\pi}{2} = \text{Tangent line} = y$$
$$= 2x$$

$\frac{\pi}{2} + \frac{\pi}{8} = \frac{5\pi}{8}$

6d $y = -\frac{1}{2}(x - \frac{\pi}{4}) + \frac{\pi}{2}$
$= 2x + \frac{5\pi}{8}$

3pts.

No double jeopardy if you got normal line based off m_{tan} in part c.

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

want $\Delta V \approx dV \le .005V$

$V = \pi r^2 h$

h = 6" is fixed
concerned w/ "r" & its error.

$V = 6\pi r^2$

$dV = 12\pi r\, dr$

$\Delta V \approx 12\pi r\, dr \le .005(\pi(2)^2(6))$

$12\pi(2)\, dr \le .005(12)(2)\pi$

$dr \le .005$ inches

error in measurement of r

% error = (Relative error)(100%)

$= \left(\frac{\Delta r}{r}\right)(100\%)$

$\approx \left(\frac{dr}{r}\right)(100\%)$

$= \left(\frac{.005}{2}\right)(100\%)$

$= (.0025)(100)$

$= .25\%$

8. $\frac{40}{25\pi} = \frac{8}{5\pi}$

(9) $\sqrt{103}$ · $\sqrt[3]{25}$ on test.

$\sin(62^\circ)$ $\qquad f(x) = \sin x$

$a = 60^\circ = \frac{\pi}{3}$ radians $\qquad f'(x) = \cos x$

Tan. Line Version

$y = f'(a)(x-a) + f(a)$

$= \frac{1}{2}\left(x - \frac{\pi}{3}\right) + \frac{\sqrt{3}}{2}$

$f(a) = \sin\left(\frac{\pi}{3}\right)$
$= \frac{\sqrt{3}}{2}$

$f'(a) = \cos\left(\frac{\pi}{3}\right)$
$= \frac{1}{2}$

Want $62^\circ = 60^\circ + 2^\circ$
$= \frac{\pi}{3} + 2\left(\frac{\pi}{180}\right) = \frac{\pi}{3} + \frac{\pi}{90}$

$y = \frac{1}{2}\left(\frac{\pi}{3} + \frac{\pi}{90} - \frac{\pi}{3}\right) + \frac{\sqrt{3}}{2}$

$= \frac{1}{2}\left(\frac{\pi}{90}\right) + \frac{\sqrt{3}}{2}$

$= \frac{\pi}{180} + \frac{\sqrt{3}}{2}$

(10) Differentials:

$y = f'(a)\underbrace{(x-a)}_{(x-a)} + f(a)$

compute directly:
Δx $62^\circ - 60^\circ$ OR
$\frac{\pi}{3} + \frac{\pi}{90} - \frac{\pi}{3}$
$= \frac{\pi}{90} = \Delta x$

$y = f(a + \Delta x) \approx f(a) + f'(a)\Delta x$

$= f'(a)\Delta x + f(a)$

$= \frac{1}{2}\left(\frac{\pi}{90}\right) + \frac{\sqrt{3}}{2}$

Differentials!

$\Delta x = x - a$

(11) L(x) IS the tangent line

$\frac{\pi}{180} + \frac{\sqrt{3}}{2}$

Limits.

$$\lim_{x\to 3}(x-7) = -4$$

$$\lim_{x\to 3}\frac{x^2-4x+3}{x-3} = \lim_{x\to 3}\frac{\cancel{(x-3)}(x-1)}{\cancel{x-3}}$$

$\sqrt{4}=2$

$a=1, b=-4, c=3$

$b^2-4ac = (-4)^2-4(1)(3)$

$= 16-12 = 4$

$x = \dfrac{4\pm 2}{2} < {}^{3}_{1}$

$x^2-4x+3=0$

$x^2-4x+2^2 = -3+4$

$(x-2)^2 = 1$

$x-2 = \pm 1$

$x = 2\pm 1$

$3 \Rightarrow (x-3)$ is factor

$1 \Rightarrow (x-1)$ is factor

$$= \lim_{x\to 3}(x-1) = 2$$

Derivative by defin.

Quadratic $2x^2-5x+2$

$$\frac{f(x+h)-f(x)}{h} = \frac{2(x+h)^2-5(x+h)+2-(2x^2-5x+2)}{h}$$

$$= \frac{2(x^2+2xh+h^2)-5x-5h+2-2x^2+5x-2}{h}$$

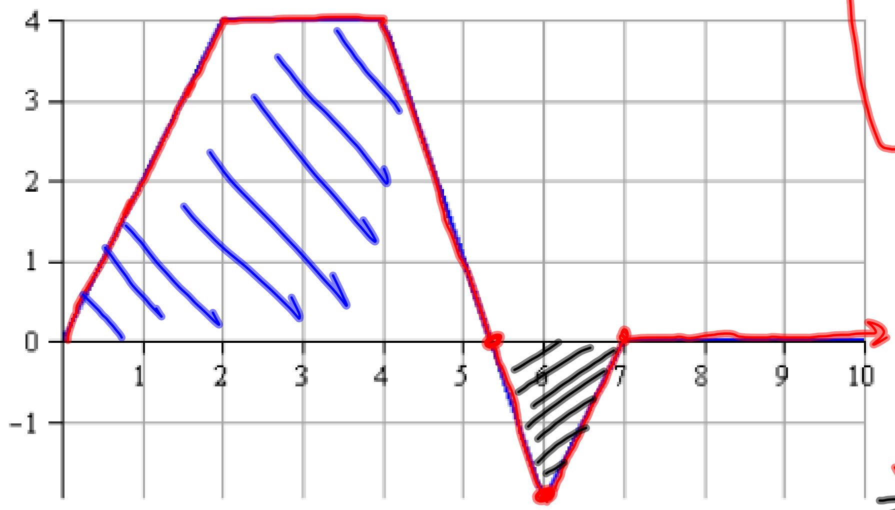
$$= \frac{2x^2+4xh+2h^2-5x-5h+2-2x^2+5x-2}{h}$$

$$= \frac{4xh+2h^2-5h}{h} = \frac{(4x+2h-5)h}{h}$$

$$= 4x+2h-5 \xrightarrow{h \to 0} 4x-5$$

Oct 12-12:44 PM

Avg Rate of Change



$$\boxed{A = \tfrac{1}{2}(5.5 + 2)(4) - \tfrac{1}{2}(1.5)(2)}$$

= Distance

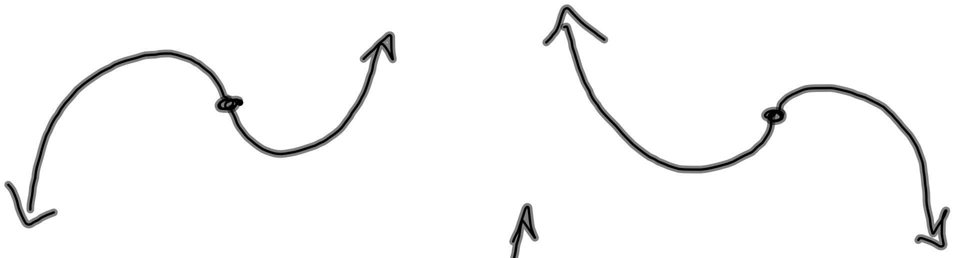
= area under velocity curve.

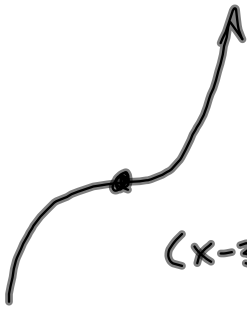
Total Distance

$$= \boxed{\tfrac{1}{2}(7.5)(4) + 1.5}$$

Graph a cubic polynomial

Max, min, y-int, inflection pt.





$(x-3)^3$

$x^2-5x-14$

$3x^2-15x-42$

$f(x) = x^3 - \frac{15}{2}x^2 - 42x + 11$

$f(0) = 11 \rightsquigarrow (0,11)$

$f'(x) = 3x^2 - 15x - 42 \overset{\text{SET}}{=} 0$

$3(x^2-5x-14) = 0$

$(x-7)(x+2) = 0$

$x \in \{-2, 7\}$ c.p.'s.

$f''(x) = 6x - 15 \overset{\text{SET}}{=} 0$

$6x = 15$ INFLECTION

$x = \frac{15}{6} = \frac{5}{2}$ Pt, here.

$f(-2), f(7), f(\frac{5}{2})$

$$x^3 - \frac{15}{2}x^2 - 42x + 11 = f(x) \Longrightarrow$$

Dividing by $x+2$

$$\begin{array}{r|rrrr} -2 & 1 & -\frac{15}{2} & -42 & 11 \\ & & -2 & 19 & 46 \\ \hline & 1 & -\frac{19}{2} & -23 & 57 \end{array}$$

$57 = f(-2) \longrightarrow (-2, 57)$

$$\begin{array}{r|rrrr} 7 & 1 & -\frac{15}{2} & -42 & 11 \\ & & 7 & -\frac{203}{2} & \\ \hline & 1 & -\frac{29}{2} & & \end{array}$$

$$\begin{array}{r} 29 \\ \times\ 7 \\ \hline 203 \end{array}$$

$$\begin{array}{r} 287 \\ \times\ 2 \\ \hline 574 \end{array}$$

etc.

x