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1. $f(x) = \frac{x-6}{x^2+2}$

a. $f'(x) = \frac{(x^2+2)(1) - (x-6)(2x)}{(x^2+2)^2}$

$= \frac{x^2+2-2x^2+12x}{(x^2+2)^2} = \frac{-x^2+12x+2}{(x^2+2)^2}$

b. @ $x = 2$

$f'(2) = \frac{-(2)^2+24+2}{(2^2+2)^2} = \frac{11}{18}$

c. $m: \frac{11}{18}$ $\quad \frac{x}{2} \mid \frac{y}{\frac{2-6}{2^2+2}} = \frac{-4}{6} = -\frac{2}{3}$

$y = \frac{11}{18}(x-2) - \frac{2}{3}$

d. $y = \frac{-18}{11}(x-2) - \frac{2}{3}$

2. $f(x) = x^3 - 2x^2 - 4x + 2$

a. $f'(x) = 3x^2 - 4x - 4$

b. $f'(0) = -4$

c. $f'(1) = -5$

d. $f'(2) = 0$

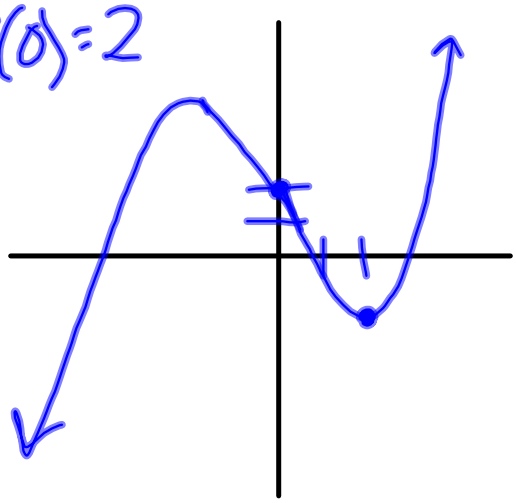
e. $f'(3) = 11$

f. neg deriv: dec.

deriv = 0 : min/max

pos deriv: inc

g. $f(0) = 2$



?s

how fast - speed

how far < distance / displacement

position

Direction - velocity

Acceleration - change in velocity

time

Position: $s(t)$

Displacement: $\Delta s = s(t_2) - s(t_1)$

Average Velocity: $\frac{\Delta s}{\Delta t} = \frac{s(t_2) - s(t_1)}{t_2 - t_1}$

Instantaneous Velocity: $v(t) = s'(t)$

Speed: $|v(t)|$

Acceleration: $a(t) = v'(t) = s''(t)$

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3. $s(t) = t^3 - 2t^2 - 4t + 2$

a. $[0,3]$

$$\frac{s(3)-s(0)}{3-0} = \frac{3^3-2(3)^2-12+2-(0-0-0+2)}{3}$$

$$= -\frac{3}{3} = -1 \text{ ft/sec.}$$

b. $v(3)$

$v(t) = s'(t) = 3t^2 - 4t - 4$

$v(3) = 3(3)^2 - 4(3) - 4 = 11$ ft/sec.

c. $a(3)$

$a(t) = v'(t) = s''(t) = 6t - 4$

$a(3) = 18 - 4 = 14$ ft/sec$^2$

d. $|v(1)| = |3-4-4| = 5$ ft/sec.

e. $\Delta s$: $s(3) - s(0) = -3$ ft

f. $3t^2 - 4t - 4 = 0$

$(3t+2)(t-2) = 0$

$t = -\frac{2}{3}, 2$

4. $S(t) = 1.86t^2$

$v(t) = s'(t) = 3.72t = 20$

$t = 5.376$ sec.

5. $S(t) = 11.44t^2$

$V(t) = S'(t) = 22.88t$

$t = .874$

moving away from origin: Speeding up

moving toward origin: Slowing down

Speeding Up: when $v(t)$ & $a(t)$ have same sign.

Slowing Down: when $v(t)$ & $a(t)$ have opposite signs.

6. a. Forward: $v > 0$ : $(0,5)$

Backward: $v < 0$ : $(5,9) \cup (9,10)$

b. Speeding up: $(0,2) \cup (5,6) \cup (9,10]$

Slowing down: $(4,5) \cup (6,9)$

Stopped: $t = 0, 5, 9$

c. $a > 0$ : $(0,2) \cup (6,9)$

$a < 0$ : $(4,6) \cup (9,10]$

e. max Speed: $|v|_{max}$

$(2,4)$ , 6