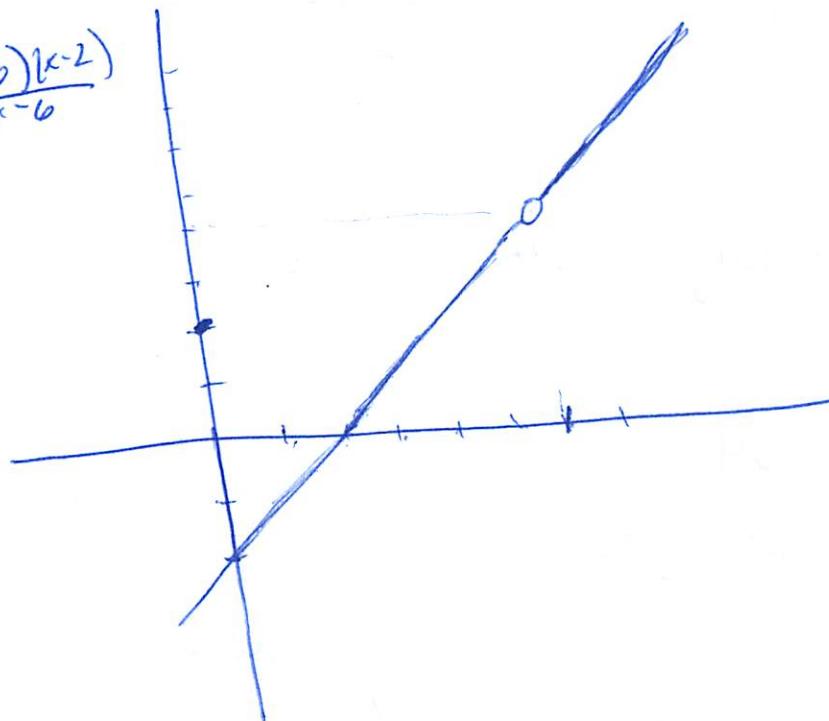


Test 2 Form A

$$f(x) = \frac{(x-6)(x-2)}{x-6} = x-2 \text{ as long as } x \neq 6$$

graph :

$$(x) = \frac{(x-6)(x-2)}{x-6}$$

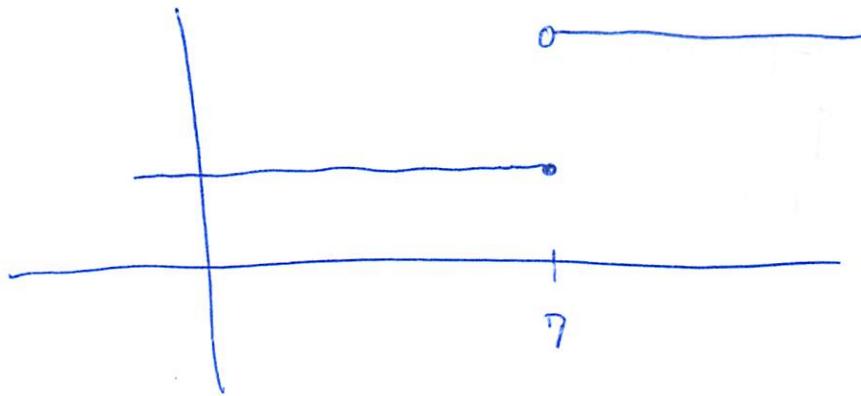


$$\lim_{x \rightarrow 6} f(x) = 4$$

$$x \rightarrow 6$$

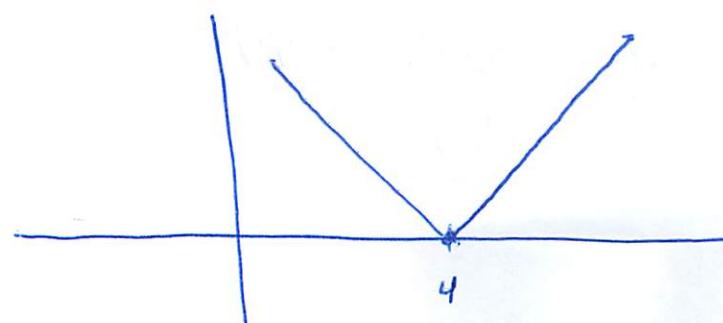


a)



$$\lim_{x \rightarrow 7} f(x) \text{ DNE}$$

b)



continuous, but
not differentiable

3.

$$(a) \quad s(t) = -16t^2 + 64t + 1$$

Average Velocity over interval $t=1$ to $t=3$:

$$\frac{s(3) - s(1)}{3 - 1} = \frac{49 - 49}{2} = 0$$

(b) Instantaneous velocity: $s'(t)$ w/ $t=1$
at $t=1$

$$s'(t) = -32t + 64$$

$$s'(1) = -32 + 64 = \underline{\underline{32}}$$

(c) Eqn of tangent line $y - y_0 = \overset{\text{derivative}}{m}(x - x_0)$

$$y - 49 = 32(x - 1)$$

$$\begin{matrix} \uparrow & \uparrow \\ s(1) & s'(1) \end{matrix}$$

Now plug in $x=5$

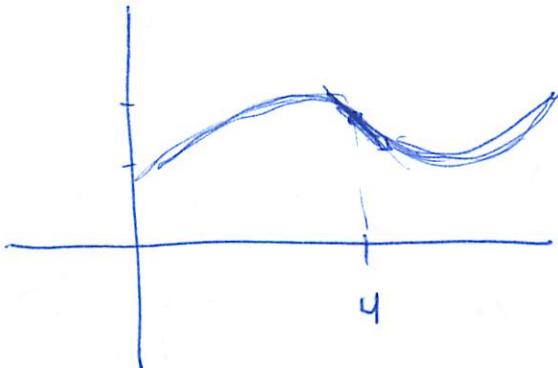
$$y - 49 = 32(5 - 1)$$

$$\begin{aligned} y &= 32 \cdot 4 + 49 \\ &= \underline{\underline{177}} \end{aligned}$$

4. $f(4)=2$, $f'(4) = -1$ (Decreasing)

$x=4$ is an inflection pt w/ } That means
 $f''(x) < 0$ when $x < 4$. } the graph
 changes from
 c-down to c-up

Solution



$$f(x) = 3x^4 - 4x^3$$

$$f'(x) = 12x^3 - 12x^2$$

$$0 = 12x^3 - 1Lx^2$$

$$O = 12x^2(x - 1)$$

$$x=0, x=1$$

Decreasing:

$$(-\alpha_1, 1)$$

Increasing
(1, ∞)

$$^{\circ} \text{ test } x = y_2$$

$$12(\gamma_2)^2(\gamma_2 - 1) \begin{cases} \text{neg} \\ + \\ - \end{cases}$$

• test $x = 2$

$$12(2)^2(2-1) \quad \{ \text{PSS}$$

(b) $x=1$ $f(1) = -1$ is a relative minimum

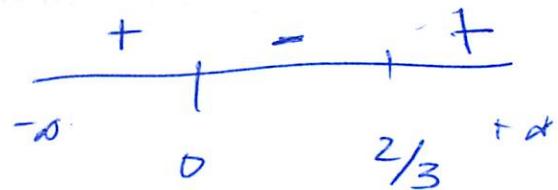
(c) $f'(x) = 12x^3 - 12x^2$

$$f''(x) = 36x^2 - 24x$$

$$0 = 36x^2 - 24x$$

$$0 = 12x(3x - 2)$$

$$x=0, x=\frac{2}{3}$$



• Test $x = -1$

$$12(-1)(3 \cdot -1 - 2) \quad \left. \begin{array}{l} \text{pos} \\ \text{neg} \end{array} \right\}$$

Concave up:

$$(-\infty, 0) \cup (\frac{2}{3}, +\infty)$$

Concave down

$$(0, \frac{2}{3})$$

• Test $x = \frac{1}{3}$

$$12(\frac{1}{3})(3 \cdot \frac{1}{3} - 2)$$

$$= 12(\frac{1}{3})(1 - 2) \quad \left. \begin{array}{l} \text{neg} \\ + \end{array} \right\}$$

• test $x = 3$

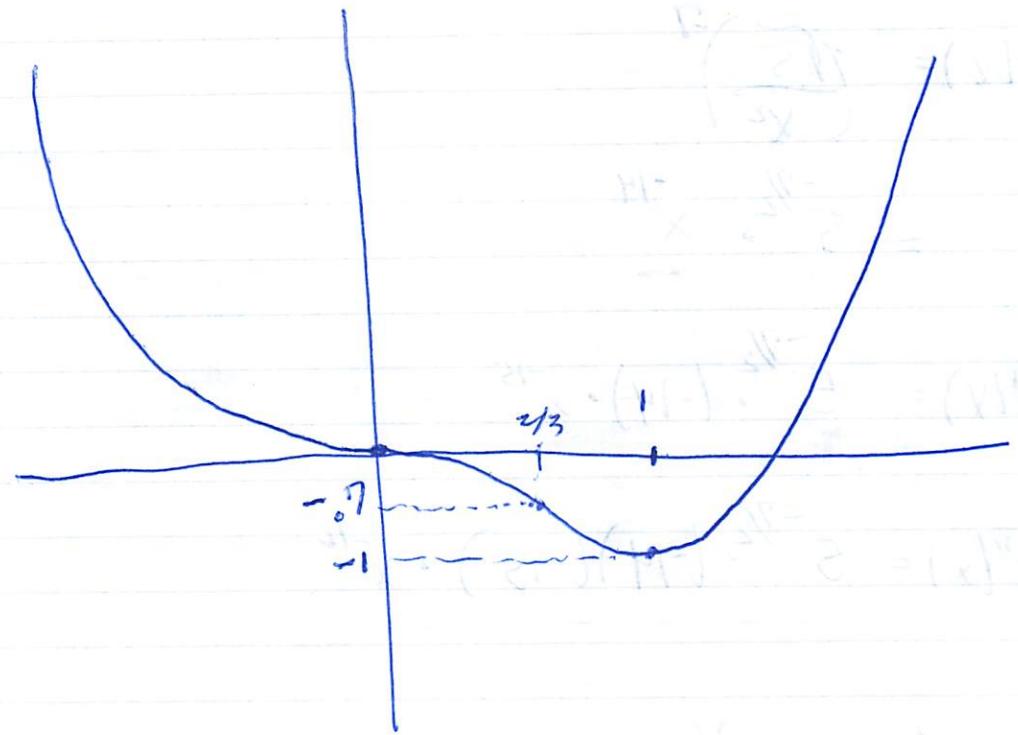
$$12(3)(3 \cdot 3 - 2) \quad \left. \begin{array}{l} \text{pos} \\ + \end{array} \right\}$$

(d) Inflection pts:

• $x=0$ $f(0) = 0$

• $x=\frac{2}{3}$ $f(\frac{2}{3}) \approx -.7$

5(e)



b. (a) The car is traveling fastest at the point a because the tangent line at a has the largest slope.

(You could also say, "The tangent line at the point a is steepest".)

(b) The velocity is decreasing near the point c.

(c) At the point d the car has negative acceleration.

Differentiation portion

1.

$$(a) \quad f(x) = \left(\frac{f(5)}{x^2} \right)^{-7}$$

$$= \underline{\underline{5^{-7/2} \cdot x^{-14}}}$$

$$f'(x) = 5^{-7/2} \cdot (-14) \cdot x^{-15}$$

$$f''(x) = \underline{\underline{5^{-7/2} \cdot (-14) \cdot (-15) \cdot x^{-16}}}$$

$$(b) \quad f(x) = 7(\pi^2 - 9x)^{17}$$

$$f'(x) = 7 \cdot 17 (\pi^2 - 9x)^{-6/7} \cdot (-9)$$

$$= \underline{\underline{-9 (\pi^2 - 9x)^{-6/7}}}$$

$$f''(x) = -9 \cdot (6/7) (\pi^2 - 9x)^{-13/7} \cdot (-9)$$

$$= \underline{\underline{81 \cdot (6/7) (\pi^2 - 9x)^{-13/7}}}$$

Test 2 Derivative portion Continued

2. $F(x) = (x^2 + 3)^4 + (5x^3 + 7x)^8$

(a) $f'(x) = \underline{4(x^2+3)^3(2x) + 8(5x^3+7x)^7(15x^2+7)}$

(b) $f(x) = 7 \cdot (3x^2 + 2x + 1)^{-1}$

$f'(x) = \underline{-7(3x^2 + 2x + 1)^{-2} \cdot (6x + 2)}$