Precalc

Study Guide Unit One

Be able to apply the difference quotient to various functions. the difference quotient is $\dfrac{f(x+h)-f(x)}{h}$; $h \neq 0$

$f(x)=3x-10$

$$\frac{3(x+h)-10-(3x-10)}{h}$$

$$\cancel{3x}+3h-\cancel{10}-\cancel{3x}+\cancel{10}$$

$$\frac{3\cancel{h}}{\cancel{h}}=\boxed{3}$$

$f(x)=-2x^2-x$

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

$$-2(x^2+2xh+h^2)-x-h+2x^2+x$$

$$\cancel{-2x^2}-4xh-2h^2\cancel{-x}-h\cancel{+2x^2}\cancel{+x}$$

$$-4xh-h-2h^2$$

$$\frac{\cancel{h}(-4x-1-2h)}{\cancel{h}}$$

$$\boxed{-4x-1-2h}$$

$f(x)=6x^2-x+3$

Next Page

Precalc

Study Guide Unit One

Be able to apply the difference quotient to various functions. the difference quotient is $\frac{f(x+h)-f(x)}{h}$; $h \neq 0$

$f(x)=3x-10$

$f(x)=-2x^2-x$

$f(x)=6x^2-x+3$

$$\frac{6(x+h)^2-(x+h)+3-(6x^2-x+3)}{h}$$

$$6(x^2+2xh+h^2)-x-h+3-6x^2+x-3$$

$$\cancel{6x^2}+12xh+6h^2-\cancel{x}-h+\cancel{3}-\cancel{6x^2}+\cancel{x}-\cancel{3}$$

$$12xh-h+6h^2$$

$$\frac{\cancel{h}(12x-1+6h)}{\cancel{h}}$$

$$\boxed{12x-1+6h}$$

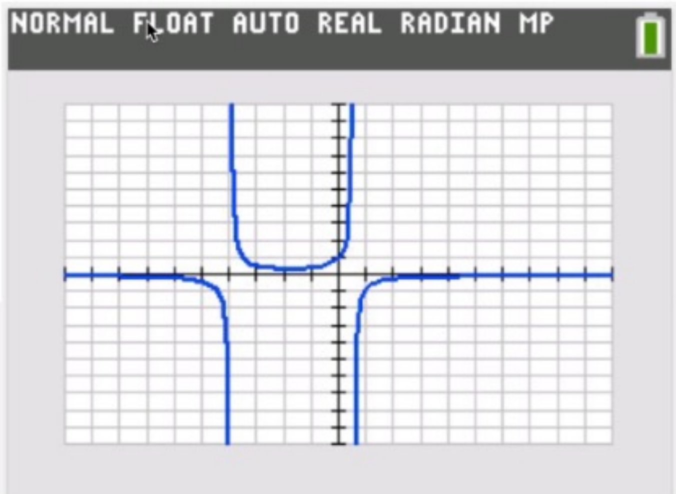
Determine of domain from a function/graph and state in interval notation.

$f(x)=\frac{-4}{2x^2+7x-4}$ $f(x)=\sqrt{2-5x}$ $f(x)=\sqrt{x^2-25}$ $f(x)=\frac{1}{x^2+8}$

$2x^2+7x-4=0$

$x^2+7x-8=0$

-8 8 -1 7



$(x+\frac{8}{2})(x-\frac{1}{2})=0$

$(x+4)(2x-1)=0$

$x+4=0$ $2x-1=0$

$x=-4$ $x=1/2$

$-\infty$ ∞

-4 $1/2$

$\boxed{D: (-\infty,-4)\cup(-4,1/2)\cup(1/2,\infty)}$

Remember! Domains are effected by...

① $\frac{1}{\text{zero}}$ ③ Nonsense

② $\sqrt{\text{negative}}$

Determine of domain from a function/graph and state in interval notation.

$f(x) = \dfrac{-4}{2x^2 + 7x - 4}$ $\qquad$ $f(x) = \sqrt{2 - 5x}$ $\qquad$ $f(x) = \sqrt{x^2 - 25}$ $\qquad$ $f(x) = \dfrac{1}{x^2 + 8}$

$2 - 5x \geq 0$

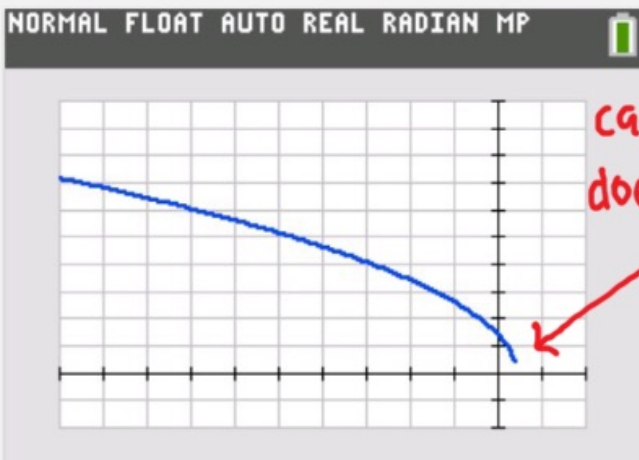
$-5x \geq -2$

$x \leq 2/5$

$-\infty$

$2/5$

$\boxed{D: (-\infty, 2/5]}$



careful, graph doesn't "finish."

Remember! Domains are effected by...

① $\dfrac{1}{\text{zero}}$

② $\sqrt{\text{negative}}$

③ Nonsense

Determine of domain from a function/graph and state in interval notation.

$f(x)=\dfrac{-4}{2x^2+7x-4}$ $\qquad f(x)=\sqrt{2-5x}$ $\qquad f(x)=\sqrt{x^2-25}$ $\qquad f(x)=\dfrac{1}{x^2+8}$

Remember! Domains are effected by...

① $\dfrac{1}{\text{zero}}$

② $\sqrt{\text{negative}}$

③ Nonsense

$x^2-25\geq 0$

$x^2-25=0$

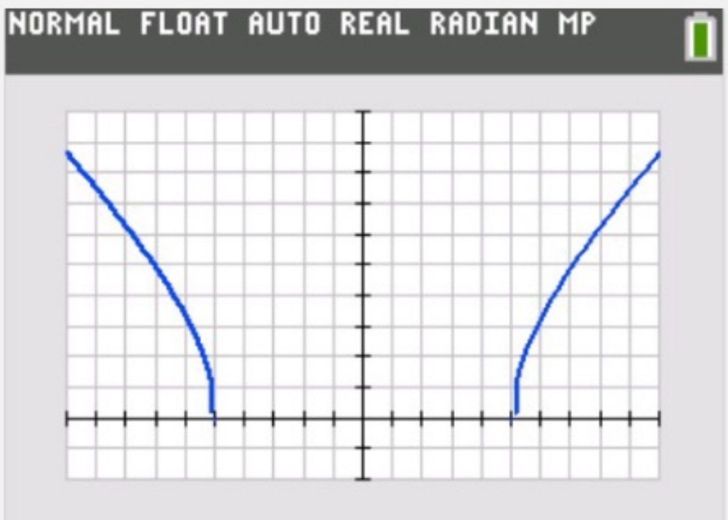
$\sqrt{x^2}=\sqrt{25}$

$x=\pm 5$

$-\infty \quad + \quad -5 \quad - \quad 5 \quad + \quad \infty$

$(-6)^2-25$	$(0)^2-25$	$(6)^2-25$
$36-25$	-25	$36-25$
11		11

$\boxed{D:(-\infty,-5]\cup[5,\infty)}$



Determine of domain from a function/graph and state in interval notation.

$f(x)=\dfrac{-4}{2x^2+7x-4}$ $\quad f(x)=\sqrt{2-5x}$ $\quad f(x)=\sqrt{x^2-25}$ $\quad f(x)=\dfrac{1}{x^2+8}$

Remember! Domains are effected by...

① $\dfrac{1}{\text{zero}}$

② $\sqrt{\text{negative}}$

③ Nonsense

$x^2+8=0$

$\sqrt{x^2}=\sqrt{-8}$

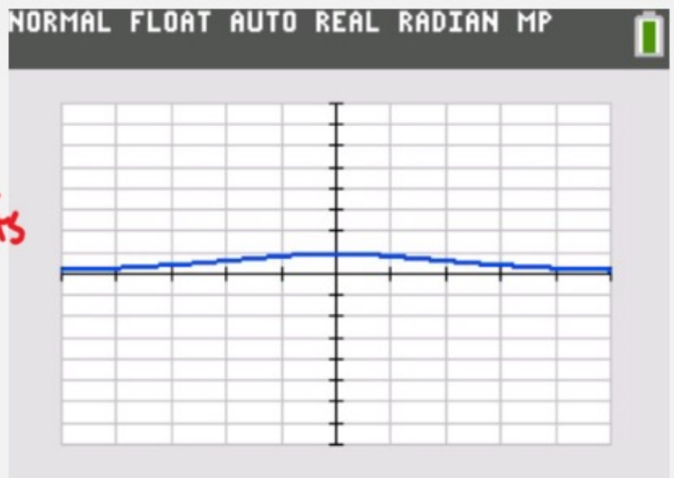
$x=\pm\sqrt{-8}$

No $\mathbb{R}$ solution

$\therefore$ there is no value of "x" that will make the denominator zero.

$D: (-\infty, \infty)$

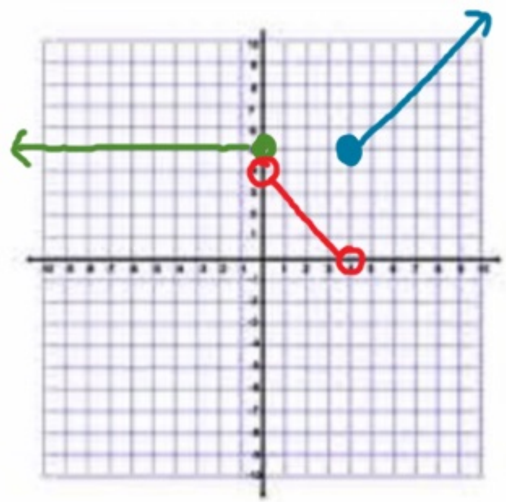
Note: y axis is scaled in 1/8 increments

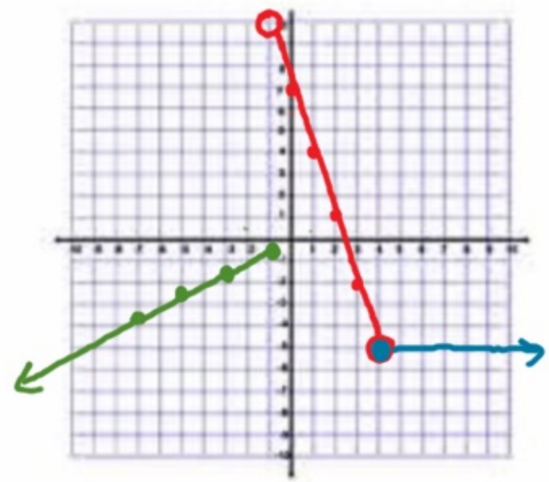


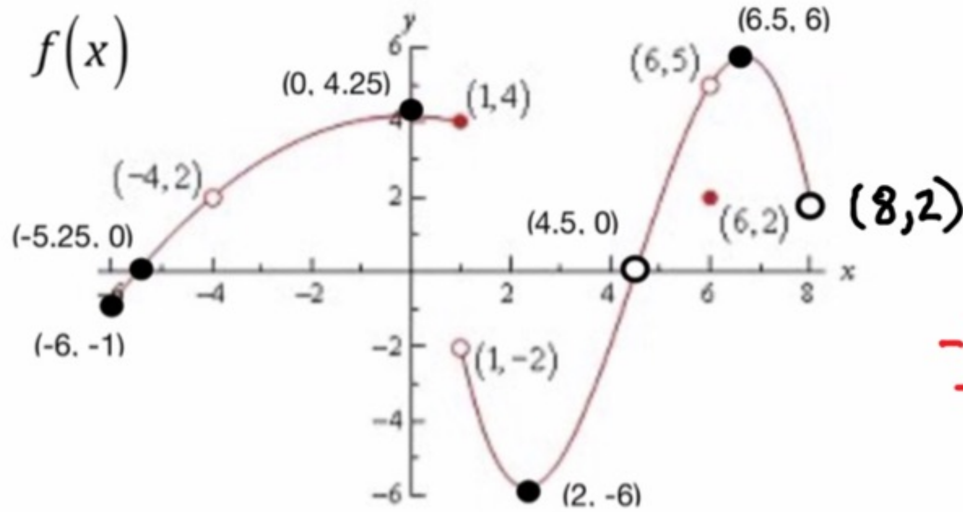
Be able to graph a piece-wise function (linear) by hand

$$f(x)=\begin{cases} 5; & x \le 0 \\ -x+4; & 0 < x < 4 \\ x; & x \ge 4 \end{cases}$$

$$f(x)=\begin{cases} \frac{1}{2}x; & x \le -1 \\ -3x+7; & -1 < x < 4 \\ -5; & x \ge 4 \end{cases}$$







$$\frac{-5.25-(-6)}{0-(-1)} = 0.75$$

Given the graph above, answer the following questions

a) Domain: [-6,-4)U(-4,4.5)U(4.5, 8)

b) Range: [-6, 6]

c) X-intercept(s): (-5.25,0)

d) Y - intercept: (0,4.25)

e) f(1) = 4

f) f(6) = 2

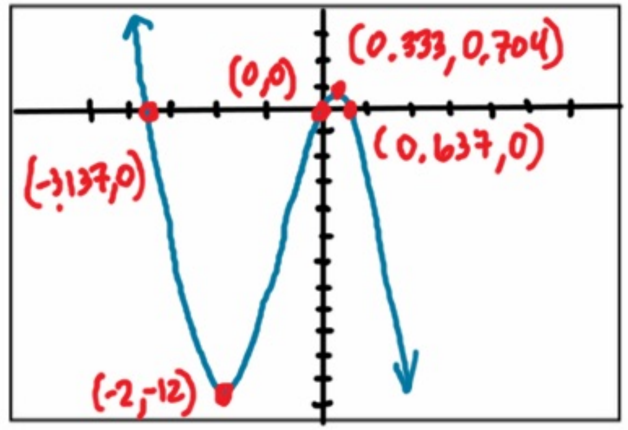
g) f(4.5) = Undef

h) f(?) = -6 therefore x is 2

i) Find the Average Rate of Change over [-6, -5.25] 0.75

(-6,-1) (-5.25,0)

Given the function $f(x) = -2x^3 - 5x^2 + 4x$ be able to find the information below using a graphing calculator. Make a sketch of the graph with all the information to right.



a) Domain: $(-\infty, \infty)$

b) Range: $(-\infty, \infty)$

c) X-intercept(s): $(-3.137, 0)$ $(0,0)$ $(0.637, 0)$

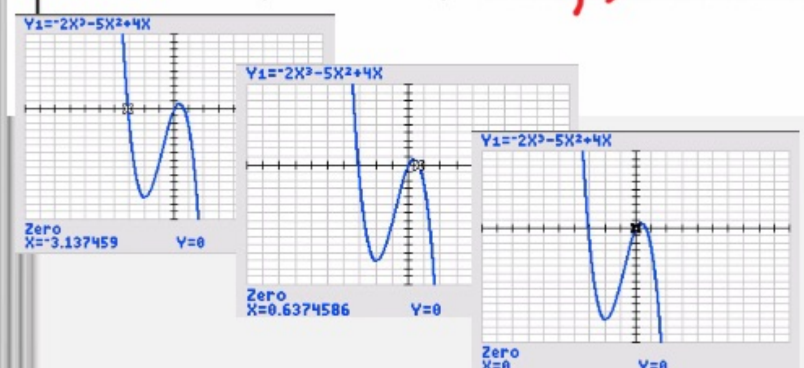
d) Y - intercept: $(0,0)$

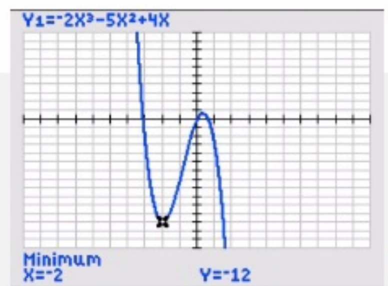
e) Relative Min(s): $(-2, -12)$

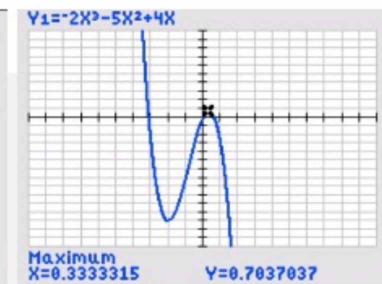
f) Relative Max(es): $(0.333, 0.704)$

g) Increasing Interval(s): $(-2, 0.333)$

h) Decreasing Interval(s): $(-\infty, -2) \cup (0.333, \infty)$







Precalc | Study Guide Unit One

Hamster race! Two hamsters challenge each other to a race. Each hamster has a different position function to model their progress as the race unfolds.

- Hamster One: $s(t)=\frac{t^3}{9}$
- Hamster Two: $s(t)=\frac{t^2}{3}$

Both where s(t) is feet and "t" is time in seconds.

That said, what hamster has the greater Average Velocity in the first three ~~minutes~~ seconds of the race? Show all calculations to support your answer. First 3min interval [0,3]

Hamster One: $S(0)=\frac{(0)^3}{9}\rightarrow(0,0)$, $S(3)=\frac{(3)^3}{9}\rightarrow(3,3)$ $\quad \frac{3-0}{3-0} = 1$ feet/sec

Hamster Two: $S(0)=\frac{(0)^2}{3}\rightarrow(0,0)$, $S(3)=\frac{(3)^2}{9}\rightarrow(3,3)$ $\quad \frac{3-0}{3-0}$ 1feet/sec

If the race lasted four ~~minutes~~ seconds, which hamster won the race? How do you know. Must be mathematically supported for credit.

Hamster One: $S(4)=\frac{(4)^3}{9}\rightarrow\frac{64}{9}\rightarrow 7.\bar{1}$ feet ← this guy.

Hamster Two: $S(4)=\frac{(4)^2}{3}\rightarrow\frac{16}{3}\rightarrow 5.\bar{3}$ feet