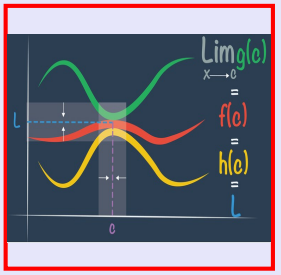
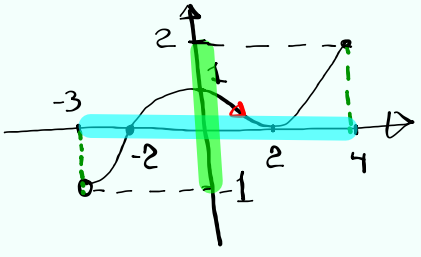
Calculus I

Lecture 2



Feb 19-8:47 AM

Consider the graph below



1) Discuss increasing / decreasing.

Inc. $(-3,0) \cup (2,4)$

Dec. $(0,2)$

2) Discuss intercepts

x-Int. $(-2,0), (2,0)$

Y-Int $(0,1)$

3) Domain & Range

x y

$(-3,4]$ $(-1,2]$

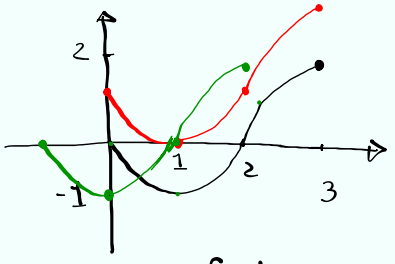
4) Determine if it belongs to a function or not.

Use V.L.T.

It belongs to a function

Aug 27-7:28 AM

Graph of $f(x)$ is given below



1) Discuss domain & Range

Domain [0,3]

Range [-1,2]

2) Discuss intercepts

x-Int (0,0), (2,0)

Y-Int (0,0)

3) Graph $f(x)+1$

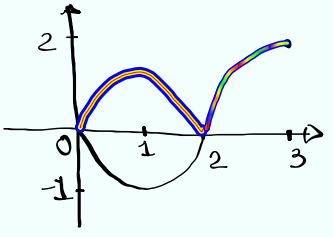
shift up 1

4) Graph $f(x+1)$

shift left 1

$x+1=0 \quad x=-1$

4) Graph $|f(x)|$



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Given $f(x)=2x^2-x-6$

1) Y-Int $\rightarrow x=0 \rightarrow f(0)=2(0)^2-0-6=-6$

$\rightarrow (0,-6)$

2) x-Int. $\rightarrow y=0 \rightarrow f(x)=0$

$2x^2-x-6=0$

Quadratic Formula

$2x^2-x-6=0$

$a=2, \; b=-1, \; c=-6$

$b^2-4ac=(-1)^2-4(2)(-6)$

$=1+48=49$

$x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$

$=\dfrac{-(-1)\pm\sqrt{49}}{2(2)}=\dfrac{1\pm7}{4}$

$x=\dfrac{1+7}{4}=2 \qquad x=\dfrac{1-7}{4}=\dfrac{-3}{2}$

Factoring

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

$2x+3=0 \qquad x-2=0$

$x=\dfrac{-3}{2} \qquad x=2$

x-Ints

$\left(\dfrac{-3}{2},0\right), (2,0)$

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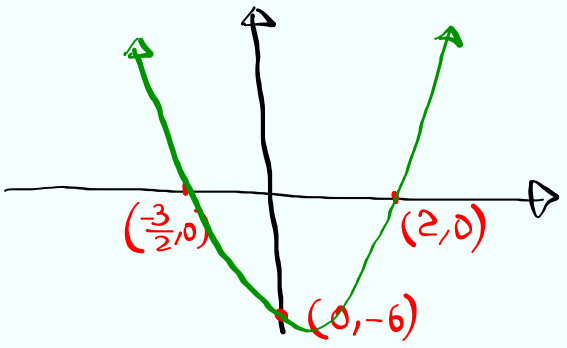
Let's graph f(x)

$f(x) = ax^2 + bx + c$

$a > 0$ → ∪ vertex

$a < 0$ → ∩



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Review of Factoring

$A^2 - B^2 = (A + B)(A - B)$

$A^2 + B^2 = \text{Prime}$

$A^3 - B^3 = (A - B)(A^2 + AB + B^2)$

$A^3 + B^3 = (A + B)(A^2 - AB + B^2)$

Factor Completely

1) $2x^2 - 200 = 2(x^2 - 100) = 2(x^2 - 10^2)$
$= 2(x + 10)(x - 10)$

2) $x^3 + 36x = x(x^2 + 36)$ → $A^2 + B^2$

3) $x^3 - 64 = x^3 - 4^3 = (x - 4)(x^2 + 4x + 16)$

4) $x^5 + 1000x^2 = x^2(x^3 + 10^3)$
$= x^2(x + 10)(x^2 - 10x + 100)$

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

1) Y-Int $f(0) = 0^2 - 2(0) = 0 \Rightarrow (0,0)$

2) X-Int $f(x) = 0$, $x^2 - 2x = 0$, $x(x-2) = 0$, $x = 0$, $x = 2$, $\Rightarrow (0,0)$, $(2,0)$

3) Find, Simplify, then evaluate $\frac{f(x+h) - f(x)}{h}$ for $h = 0$.

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

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

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

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

$= 2x + h - 2$

for $h = 0$

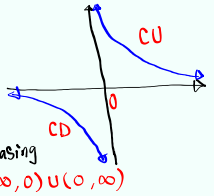
$\boxed{2x - 2}$

Aug 27-8:04 AM

Consider $f(x) = \frac{1}{x}$ Reciprocal Function

Domain $x \neq 0$

$(-\infty, 0) \cup (0, \infty)$



Discuss ints.

None

Discuss increasing/Decreasing

Decreasing $(-\infty, 0) \cup (0, \infty)$

Discuss Concavity.

CD $(-\infty, 0)$

CU $(0, \infty)$

Concave up

Concave down

as $x \to \infty$, $f(x) \to 0$ $\Rightarrow$ $\lim_{x \to \infty} f(x) = 0$ (limit)

as $x \to -\infty$, $f(x) \to 0$ $\lim_{x \to -\infty} f(x) = 0$

as $x \to 0$ from the right, $f(x) \to \infty$ $\lim_{x \to 0^+} f(x) = \infty$

as $x \to 0$ from the left, $f(x) \to -\infty$ $\lim_{x \to 0^-} f(x) = -\infty$

Aug 27-8:13 AM