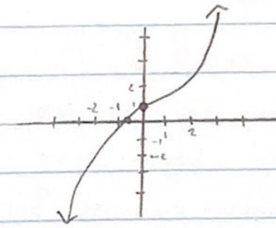
Graphing assignment

Connor Chan

Graph $y = 2x^3 + 1$



Vibes: good

Domain: $\{x \mid x \in \mathbb{R}\}$

y-int: $2(0)^3 + 1 = 1$

x-int: $0 = 2x^3 + 1$

$x = \sqrt[3]{-1/2} \approx -0.8$

max/min: $y' = 6x^2$

$x = 0$

		0
$6x^2$	+	+
	+ ↗	+ ↗

50/50

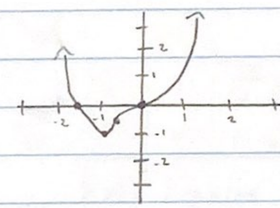
Concavity: $y'' = 12x$

$x = 0$

		0
$12x$	−	+
	− ⌢	+ ⌣

↑ $y = 1$

Graph $y = 3x^4 + 4x^3$



Vibes: wacky

Domain: $\{x \mid x \in \mathbb{R}\}$

y-int: $3(0)^4 + 4(0)^3 = 0$

x-int: $x^3(3x + 4) = 0$

$x = 0, \frac{-4}{3}$

max/min: $y' = 12x^3 + 12x^2$

$= (12x^2)(x + 1)$

$x = 0, -1$

		-1	0
$12x^2$	+	+	+
$x+1$	−	+	+
	− ↘	+ ↗	+ ↗

min at $x = -1$
$y = -1$

Concavity: $y'' = 12x^2 + (x+1)(24x)$

$= 12x(x + 2x + 2)$

$= 12x(3x + 2)$

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

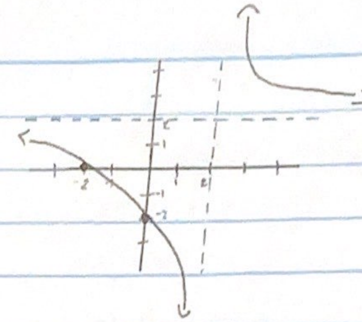
		-2/3	0
$12x$	−	−	+
$3x+2$	−	+	+
	+ ⌣	− ⌢	+ ⌣

↑ $x = -2/3$, $y = \sim -0.6$

↑ $x = 0$, $y = 0$

Hilroy

Graph $y = \frac{2x+4}{x-2}$



Vibes:

NPV: $x \neq 2$

Domain: $\{x \mid x \neq 2, x \in \mathbb{R}\}$

Vertical asymptote: $x = 2$

Horizontal asymptote: $\lim_{x \to \infty} \frac{2x+4}{x-2} = 2$

y-int: $\frac{2(0)+4}{0-2} = -2$

x-int: $0 = \frac{2x+4}{x-2}$

$x = -2$

max/min: $y' = \frac{(x-2)(2)-(2x+4)}{(x-2)^2}$

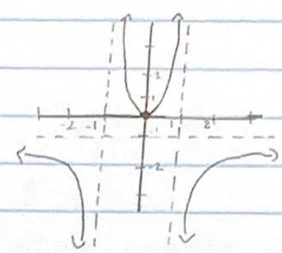
$= \frac{-8}{(x-2)^2}$ ← always negative, ← always positive → always ↘

Concavity: $y'' = 16(x-2)^{-3}$

$= \frac{16}{(x-2)^3}$ ✓

		2
16	+	+
$(x-2)^3$	−	+
	−	+

Graph $y = \frac{x^2}{1-x^2}$



Vibes: aight

NPV: $x \neq \pm 1$

Domain: $\{x \mid x \neq \pm 1, x \in \mathbb{R}\}$

Vertical asymptotes: $x = \pm 1$

Horizontal asymptote: $\lim_{x \to \infty} \frac{x^2}{1-x^2} = -1$

y-int: $\frac{0^2}{1-0^2} = 0$

x-int: $0 = \frac{x^2}{1-x^2}$

$x = 0$

max/min: $y' = \frac{(1-x^2)(2x)-(x^2)(-2x)}{(1-x^2)^2}$

$= \frac{2x}{(1-x^2)^2}$

$x = 0$

	−1		0	1
$2x$	−	−	+	+
$(1-x^2)^2$	+	+	+	+
	− ↘	− ↘	+ ↗	+ ↗

✓

min at $x = 0$
$y = 0$

Concavity: $y'' = \frac{(1-x^2)^2(2)-(2x)(2)(1-x^2)(-2x)}{(1-x^2)^{4\,3}}$

$= \frac{(1-x^2)(2)-2x(2)(-2x)}{(1-x^2)^3}$

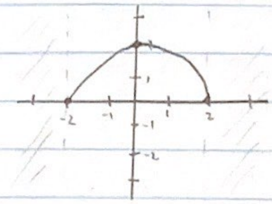
$= \frac{2(3x^2+1)}{(1-x^2)^3}$

	−1	1	
2	+	+	+
$3x^2+1$	+	+	+
$(1-x^2)^3$	−	+	−
	−	+	−

Graphing assignment continued

Connor Chan

Graph $y = \sqrt{4-x^2}$



Vibes: bad

Range: $\{y \mid y \geq 0\} \rightarrow \{y \mid 0 \leq y \leq 2, y \in \mathbb{R}\}$

Domain: $4 - x^2 \geq 0$

$-(x-2)(x+2) \geq 0$

$x = \pm 2$

		-2	+2
-1	−	−	−
x-2	−	−	+
x+2	−	+	+
	−	+	−

$\{x \mid -2 \leq x \leq 2, x \in \mathbb{R}\}$

y-int: $\sqrt{4-0^2} = 2$

x-int: $x = \pm 2$

max/min: $y' = \frac{1}{2}(4-x^2)^{-1/2}(-2x)$

$= \frac{-x}{\sqrt{4-x^2}}$

		-2	0	2
-x		+	−	
$\sqrt{4-x^2}$		+	+	
		+ ↗	− ↘	

max at $x = 0$
$y = 2$

Concavity: $y'' = \frac{(4-x^2)^{1/2}(-1) - (\frac{1}{2})(4-x^2)^{-1/2}(-2x)(-x)}{(4-x^2)}$

$= \frac{(4-x^2)^{-1/2}[(4-x^2)(-1) - (\frac{1}{2})(-2x)(-x)]}{(4-x^2)}$

$= \frac{(-4+x^2-x^2)}{\sqrt{(4-x^2)^3}}$

$= \frac{-4}{\sqrt{(4-x^2)^3}}$ ← always negative ← always positive } → always $\frown$