

(Copy) "The Curves and The Ideal Line." An Insight

How to Drive In and Out of Corners Effectively

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It is a perfect day for driving, the sun is out and conditions are dry. You decide to take your Porsche, Rx-7, Ford Mustang, Lancer Evolution, or the family Subaru, out for a spin. No one is on the road, so you speed into and out of corners. You have done this before; you know how to go into and out of a corner by muscle memory at this point, but you begin to think, how does one actually corner well, and how can you apply this to actually racing? "The Curves and The Ideal Line," a 1957 article in the Porsche company's lifestyle magazine, Christophorus describes in detail how to effectively corner while racing [1]. Surprisingly, sixty years later, it still holds up.

By the late 1950s, Porsche was making its mark in auto racing and Richard von Frankenberg, the editor of Christophorus, advised readers that "racing sport requires detailed work, asks for a fine technique of driving, and inches and tenths of seconds do count" (3). "For every course and for every vehicle," he continued,

“there exists what experts call the ideal line,” the most important part of racing efficiently and effectively.

Frankenberg teaches readers, then and now, both the process of cornering and how you should learn to race. He argues that for racing, you must understand the course before attempting to race it. When it comes to understanding the course, he points out that one must consider the track layout, track surface, and car limits.

The ideal line will come from understanding the track. However, you must understand the limits of your car as well, for different cars require different lines (4). If you do not understand your line, you risk possibly oversteering or understeering, which wastes precious fragments of time. Oversteering is when the car turns more than you turned the steering wheel. Understeering is the opposite [2]. For more info check out this video!

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But what does the so-called “ideal curve” look like? That line "consists of the biggest radius permitted by the track." But don't you want to cut corners and drive the *shortest* line around the track? Enticing logic indeed but read on.

When entering the Zenith, or the apex of the corner pictured below, the right wheels should be on the inside right of the road. (Note that the racing apex is not necessarily the same as the geometric apex, or visual middle, of the turn.) When you exit this curve and speed up, you do so at the acceleration point. Accelerating out of this curve should result in the left wheels almost touching the left-hand curb (5) [3].

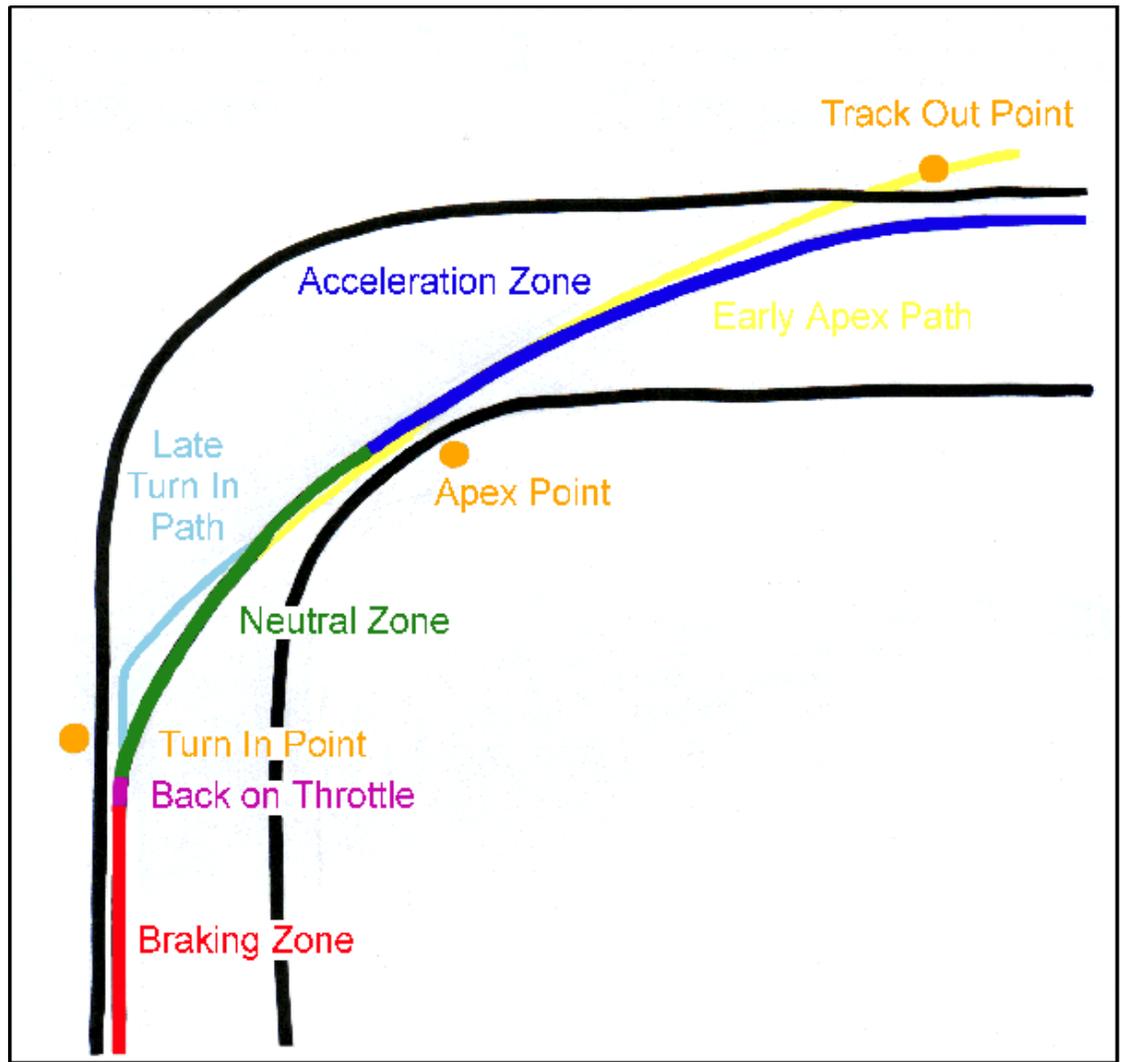


Image taken from Porsche Club of America North Country Region Website.

However, this is a simple curve. Most roads and tracks employ consecutive corners, which are much harder to navigate. When racing through compound curves, the most important curve is the final one, out of which you can accelerate hard without drifting outward—if you have studied the course well. This is where better racers pass less-skilled racers. For racing fans, think about when one driver passes another by going wide into the curve and accelerating after the apex (pictured below to the right).

The younger driver’s mistakes, Frankenberg points out, are often not using the whole width of the track to optimize their corner exits. Inches of space can result in lost time. He notes that in a 30-lap race on a track with a combination of 15 curves, losing 1/10 of a second per curve to your competitor will result in a 45-second gap at the finish line. Cutting down on that gap will come with attention and experience.

When driving, the racer should create a “safety zone” in which they can afford to

make mistakes such as braking too late, too early, or improper shifting. This can help you recover speed, but be careful not to leave too much room, or you might get passed! Additionally, you cannot exit a corner *too* quickly, as you may lose control of the car and crash (safety first!) - picture those F1 drivers who inevitably go out of the track limits into the first corner.

Not leaving too much room, going the correct speed, and following your imagined ideal line will make your driving as efficient as possible, but what is actually going on inside the cab? While driving through curves, you'll want to manipulate the brakes and accelerator smoothly, as sudden stops or starts can be dangerous.

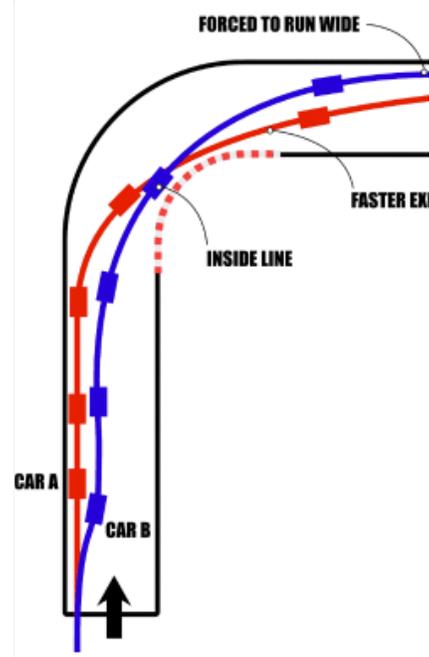


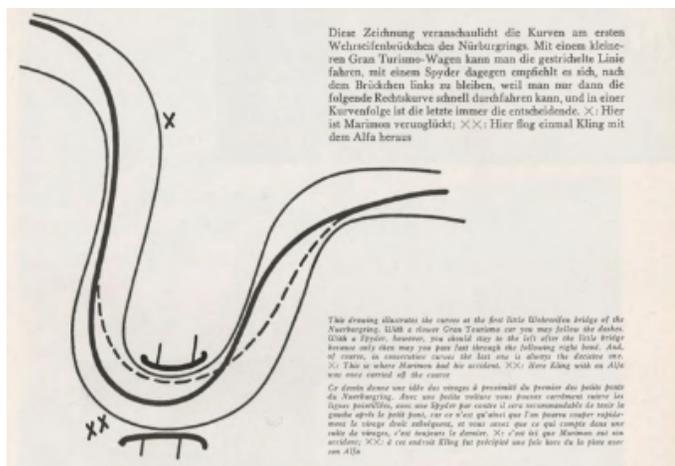
Image taken from driving

Now, what about curves with different radii, and what if that radius is incredibly narrow? If that is the case, you must not attack the corner with your regular line. If a curve is narrower, you must be wary of wheelspin, which can happen when one goes too quickly into a corner. If this happens, the wheels to the inside of the curve "may spin because the weight shifts to the other wheel." This will prevent the entirety of the engine's power from being used on the road and the tire grip will falter.

It is here that you may "drift" your car. If the tire grip fails, one may have to understeer or oversteer to correct the wheelspin (depending on the transmission layout). When rear wheelspin is combined with oversteering and an ideal line, you are able to drift through corners (although it is often more complicated than this due to braking, tire direction, shifting, and so on) [5]. The back tires of your car will lose traction, but manipulating the brakes and throttle carefully will allow you to go sideways! Check out the "Understeer & Oversteer" video above to learn more.

Now, back to narrow radii. If you are going into a hairpin curve (as pictured below) without a car that has a locking transmission (or limited slip differential in front-engine, rear-drive cars), you cannot follow the original ideal line. When going through a hairpin curve, you should stay on the outside of the curve rather than the inside, as this reduces inside wheel spin. If you stay on the outside of the curve, you are "give[n] the advantage of more braking time." This is followed by a sharp turn in which one can accelerate out of the corner. However, actual racing is different. F1 cars, for example, are designed to have tire grip at high speeds, and

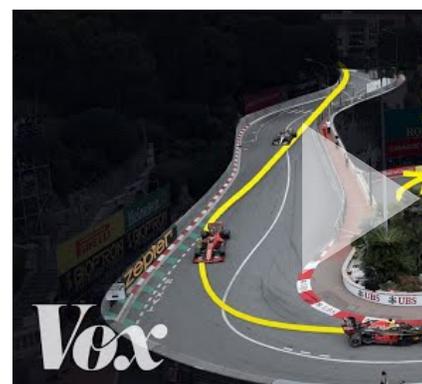
the diagram below does not apply to all cars (See the video below).



Taken from "The Curves and The Ideal Line" Christophorus 1957, Vol. 9

By driving the ideal line, you can traverse corners with the utmost accuracy and speed. Achieving this line, however, comes with much practice in steering, braking, and shifting. You should seek to keep to the outside of the road or track before the corner and then turn into that corner before accelerating past its apex. By doing this, you will surely outrace your competition.

Racing in and out of corners can be difficult and dangerous. So, if you are feeling daring, practice on a track! Check out this video from Vox that goes in-depth on how F1 drivers navigate turns at high speeds!



How F1 racers turn really fast <https://watch?v=KBXMan0>

Despite its 1957 publication date, "The Curves and the Ideal Line" by Richard Von Frankenberg holds up. The skills he described are still utilized today by racers in the highest level of motorsport. Thrashing in and out of corners has been the desire of racing enthusiasts for more than sixty years. To corner quickly, remember to follow your ideal line . . . in a safe manner, and know your limits! Once you have determined the Ideal Line of a track and practiced it many times, then you'll be ripping through corners in no time. Despite other advances in automobiles, cornering has remained the same.

[Madison Automotive Apprentices \(MAAP\)](#), the [JMU History Department](#), and [JMU Libraries](#) are collaboratively making historic automotive publications available for student and faculty research. Use the link below to explore hundreds of volumes of Christophorus by Porsche and Panorama, the Porsche Club of America's grassroots magazine. Use your JMU eid and password: <https://omeka.lib.jmu.edu/maap/>

[1] "The Curves and The Ideal Line" (Christophorus, 1957, Vol.9)

[2] https://en.wikipedia.org/wiki/Understeer_and_oversteer

[3] <https://ncr-pca.org/index.php/club-activities/driver-education/44-anatomy-of-a-corner>; <https://www.drivingtests.co.nz/resources/skidding-explained-oversteer-understeer-hydroplaning-and-wheelspin/>

[4] <https://drivingfast.net/racecraft-overtaking-on-a-corner/>

[5] [https://en.wikipedia.org/wiki/Drifting_\(motorsport\)](https://en.wikipedia.org/wiki/Drifting_(motorsport))

[6] <https://presskit.porsche.de/anniversaries/en/70-years-porsche-sports-cars/topic/zeitstrahl.html#11>