Section 3.6

$\boxed{153:3}$ $D\,(2x^3-1)^{40} = 40\,(2x^3-1)^{39} \cdot 6x^2$

$\boxed{153:5}$ $D\; 3\sin\sqrt{x} = 3\cos\sqrt{x} \cdot \frac{1}{2\sqrt{x}}$

$\boxed{153:8}$ $D\,\sin^3 2x = 3\sin^2 2x \cdot \cos 2x \cdot 2$

$\boxed{153:12}$ $D\,\sec^5 2x = 5\sec^4 2x \cdot \sec 2x \tan 2x \cdot 2$

$\boxed{153:13}$ $D\,\sqrt{\cot x} = \frac{1}{2}(\cot x)^{-1/2} \cdot -\csc^2 x$

$\boxed{153:17}$ $D\,\sin(3x+2)^5 = \cos(3x+2)^5 \cdot 5(3x+2)^4 \cdot 3$

$\boxed{153:18}$ $D\,\sin^5(3x+2) = 5\sin^4(3x+2) \cdot \cos(3x+2) \cdot 3$

$\boxed{153:21}$ $D\quad (2x+1)^5 \cdot (3x+1)^7$

$= (2x+1)^5 \cdot 7(3x+1)^6 \cdot 3 + 5(2x+1)^4 \cdot 2 \cdot (3x+1)^7$

$\boxed{153:24}$ $D\quad x^3 \cdot \cos^2 3x \cdot \sin^2 2x = 3x^2 \cdot \cos^2 3x \cdot \sin^2 2x$

$+ x^3 \cdot 2\cos 3x \cdot (-\sin 3x) \cdot 3 \cdot \sin^2 2x + x^3 \cdot \cos^2 3x \cdot 2\sin 2x \cdot \cos 2x \cdot 2$

$\boxed{153:27}$ $D\,\dfrac{x^2}{(x^2+1)^3} = \dfrac{(x^2+1)^3 \cdot 2x - x^2 \cdot 3(x^2+1)^2 \cdot 2x}{(x^2+1)^6}$

$\boxed{153:30}$ $D\left(\dfrac{1+2x}{1+3x}\right)^4 = 4\left(\dfrac{1+2x}{1+3x}\right)^3 \cdot \dfrac{(1+3x)(2)-(1+2x)(3)}{(1+3x)^2}$

$\boxed{153:32}$ $D\,\tan^2\sqrt{x} = 2\tan\sqrt{x} \cdot \sec^2\sqrt{x} \cdot \frac{1}{2\sqrt{x}}$

$\boxed{153:34}$ $D\,(1-x^2)^{-1/2} = \frac{-1}{2}(1-x^2)^{-3/2} \cdot (-2x)$

$\boxed{153:44}$ $D\left(\frac{1}{20}(5+2x)^5 - \frac{5}{16}(5+2x)^4\right)$

$= \frac{1}{4}(5+2x)^4 (2) - \frac{5}{4}(5+2x)^3 \cdot 2 = \frac{1}{2}(5+2x)^4 - \frac{5}{2}(5+2x)^3$

$$= \frac{1}{2}(5+2x)^3\left[(\cancel{5}+2x)-\cancel{5}\right] = x(5+2x)^3$$

$\boxed{153:49}$ $f(3)=2$, $f'(3)=4$, $g(5)=3$, $g'(5)=7$ so

$$Df(g(5)) = f'(g(5))\cdot g'(5) = f'(3)\cdot(7) = (4)(7) = 28$$

$\boxed{153:51b}$ $h(x) = f(g(x))$ so by chain rule

$$h'(2) = f'(g(2))\cdot g'(2)$$

$$\approx \frac{f(g(2.03)) - f(g(2))}{g(2.03)-g(2)} \cdot \frac{g(2.03)-g(2)}{2.03-2}$$

$$= \frac{f(3.04)-f(3)}{\cancel{3.04-3}} \cdot \frac{\cancel{3.04-3}}{2.03-2}$$

$$= \frac{4.96-5}{0.03} = \frac{-0.04}{0.03} = \frac{-4}{3}$$

$\boxed{153:52}$ $g'(x) = \frac{1}{x^3+1}$ and $h(x) = g(x^2)$ so

$$h'(x) = g'(x^2)\cdot 2x = \frac{1}{(x^2)^3+1}\cdot 2x = \frac{2x}{x^6+1}$$

Section 2.5

$\boxed{52:2}$ Function f is **even** if $f(-x)=f(x)$.

a.) $f(x)=\sqrt{1-x^2}$ and
$f(-x)=\sqrt{1-(-x)^2}=\sqrt{1-x^2}=f(x)$ so f is even.

b.) $f(x)=5x^4-x^2$ and
$f(-x)=5(-x)^4-(-x)^2=5x^4-x^2=f(x)$
so f is even.

$\boxed{52:3}$ Function f is **odd** if $f(-x)=-f(x)$.

a.) $f(x)=x^3+x$ and
$f(-x)=(-x)^3+(-x)=-x^3-x=-(x^3+x)=-f(x)$
so f is odd.

b.) $f(x)=x+\frac{1}{x}$ and
$f(-x)=(-x)+\frac{1}{(-x)}=-x-\frac{1}{x}=-(x+\frac{1}{x})=-f(x)$
so f is odd.

$\boxed{52:6b}$ $f(x)=x^3+x^2$, check at $x=1,-1$:
$f(-1)=(-1)^3+(-1)^2=-1+1=0$ and $f(1)=1^3+1^2=2$
and $f(-1)\neq f(1)$ so f is <u>NOT EVEN</u>
and $f(-1)\neq -f(1)$ so f is <u>NOT ODD</u>.

Section 2.5

$\boxed{52:16}$ $Y = \dfrac{X-2}{X^2-9}$ for $X \neq 3, X \neq -3$

$$\lim_{X\to\pm\infty} Y = \lim_{X\to\pm\infty} \frac{\left(\frac{1}{X}\right)-\left(\frac{2}{X^2}\right)}{1-\left(\frac{9}{X^2}\right)} = \frac{0}{1} = 0$$

so $Y=0$ is horizontal asymptote,

$\lim_{X\to 3^+} Y = \text{"}\dfrac{1}{0^+}\text{"} = +\infty$

$\lim_{X\to 3^-} Y = \text{"}\dfrac{1}{0^-}\text{"} = -\infty$

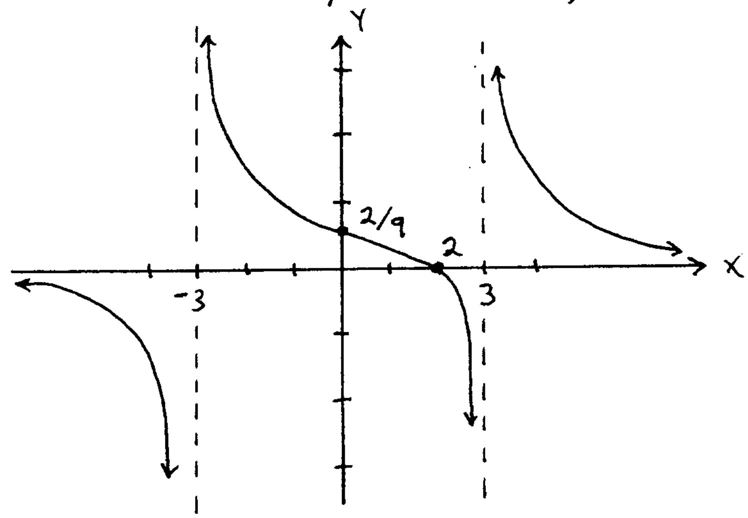
$\lim_{X\to -3^+} Y = \text{"}\dfrac{-5}{0^-}\text{"} = +\infty$

$\lim_{X\to -3^-} Y = \text{"}\dfrac{-5}{0^+}\text{"} = -\infty$

$X=0 \rightarrow Y = \dfrac{2}{9}$

$Y=0 \rightarrow X = 2$

vertical asymptotes $X=3, X=-3$



$\boxed{52:19}$ $Y = \dfrac{X^2+1}{X^2-3}$ for $X \neq \sqrt{3}, X \neq -\sqrt{3}$

$$\lim_{X\to\pm\infty} \frac{X^2+1}{X^2-3} = \lim_{X\to\pm\infty} \frac{1+\left(\frac{1}{X^2}\right)}{1-\left(\frac{3}{X^2}\right)} = \frac{1}{1} = 1$$

so $Y=1$ is horizontal asymptote,

$\lim_{X\to \sqrt{3}^+} Y = \text{"}\dfrac{4}{0^+}\text{"} = +\infty$

$\lim_{X\to \sqrt{3}^-} Y = \text{"}\dfrac{4}{0^-}\text{"} = -\infty$

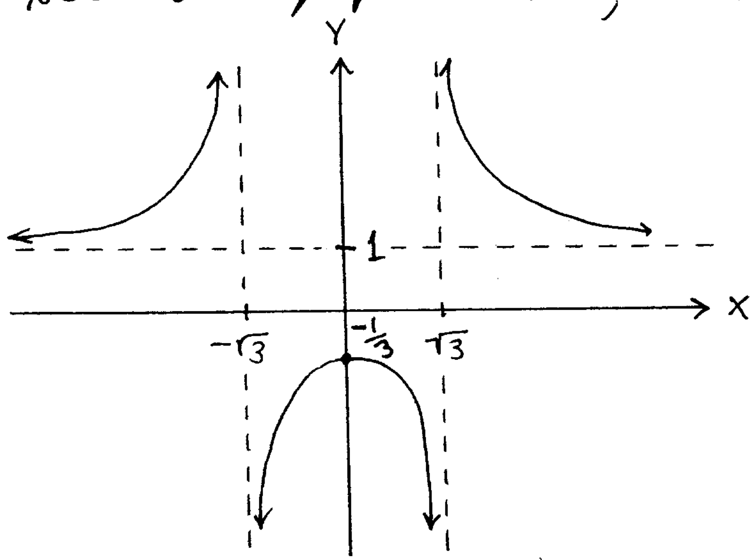
$\lim_{X\to -\sqrt{3}^+} Y = \text{"}\dfrac{4}{0^-}\text{"} = -\infty$

$\lim_{X\to -\sqrt{3}^-} Y = \text{"}\dfrac{4}{0^+}\text{"} = +\infty$

$X=0 \rightarrow Y = \dfrac{-1}{3}$

$Y=0$ impossible

vertical asymptotes $X=\sqrt{3}, X=-\sqrt{3}$



$\boxed{52:20}$ $Y = \dfrac{X}{(X+1)^2}$ for $X \neq -1$

$\lim\limits_{X \to \pm\infty} \dfrac{X}{X^2+2X+1} = \lim\limits_{X \to \pm\infty} \dfrac{\left(\frac{1}{X}\right)}{1+\left(\frac{2}{X}\right)+\left(\frac{1}{X^2}\right)} = \dfrac{0}{1} = 0$ so $Y=0$ is horizontal asymptote,

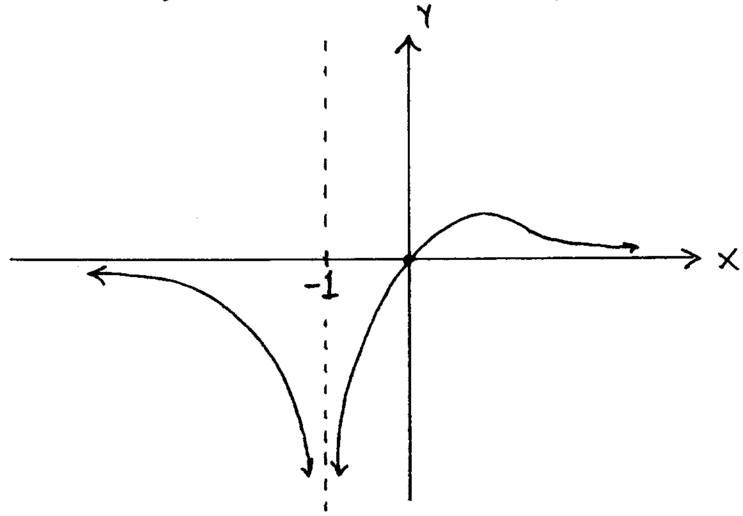
$\lim\limits_{X \to -1^+} Y = \text{"}\dfrac{-1}{0^+}\text{"} = -\infty$

$\lim\limits_{X \to -1^-} Y = \text{"}\dfrac{-1}{0^+}\text{"} = -\infty$

so vertical asymptote at $X=-1$,

$X=0 \to Y=0$

$Y=0 \to X=0$



$\boxed{52:27}$ $Y = \dfrac{1}{X(X-1)(X+2)}$ for $X \neq 0,\ X \neq 1,\ X \neq -2$

$\lim\limits_{X \to \pm\infty} Y = \text{"}\dfrac{1}{\pm\infty}\text{"} = 0$ so $Y=0$ is horizontal asymptote,

vertical asymptotes $X=0, X=1, X=-2$

$\lim\limits_{X \to 0^+} Y = \text{"}\dfrac{1}{0^-}\text{"} = -\infty$

$\lim\limits_{X \to 0^-} Y = \text{"}\dfrac{1}{0^+}\text{"} = +\infty$

$\lim\limits_{X \to 1^+} Y = \text{"}\dfrac{1}{0^+}\text{"} = +\infty$

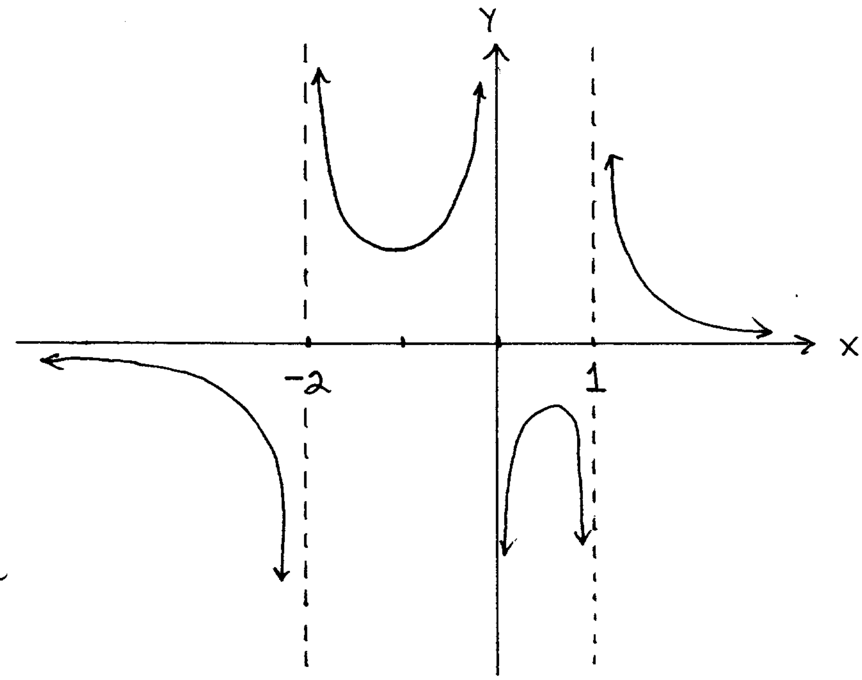
$\lim\limits_{X \to 1^-} Y = \text{"}\dfrac{1}{0^-}\text{"} = -\infty$

$\lim\limits_{X \to -2^+} Y = \text{"}\dfrac{1}{0^+}\text{"} = +\infty$

$\lim\limits_{X \to -2^-} Y = \text{"}\dfrac{1}{0^-}\text{"} = -\infty$

$X=0 \to$ impossible

$Y=0 \to$ impossible



$\boxed{52:28}$ $Y = \dfrac{X+2}{X^2(X+1)}$ for $X \neq 0, X \neq -1$

$$\lim_{X \to \pm\infty} \frac{X+2}{X^3+X^2} = \lim_{X \to \pm\infty} \frac{\left(\frac{1}{X^2}\right)+\left(\frac{2}{X^3}\right)}{1+\left(\frac{1}{X}\right)} = \frac{0}{1} = 0$$ so $Y=0$ is horizontal asymptote,

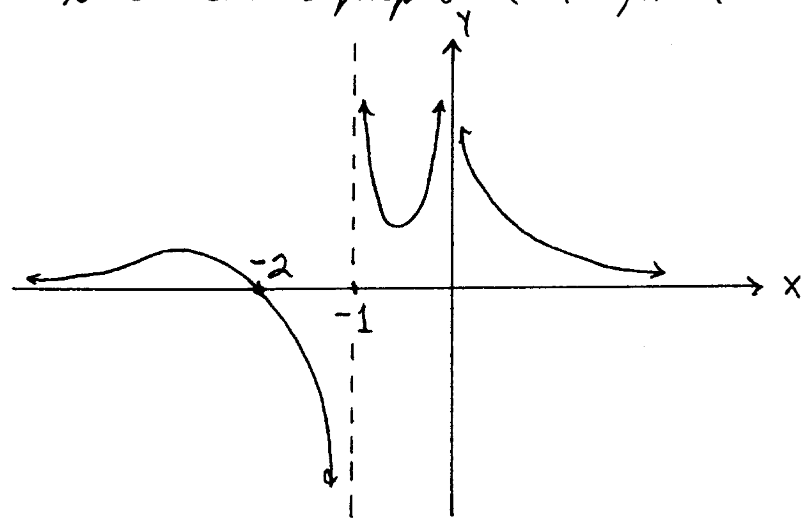
$$\lim_{X \to 0^+} Y = \text{"}\frac{2}{0^+}\text{"} = +\infty$$

$$\lim_{X \to 0^-} Y = \text{"}\frac{2}{0^+}\text{"} = +\infty$$

$$\lim_{X \to -1^+} Y = \text{"}\frac{1}{0^+}\text{"} = +\infty$$

$$\lim_{X \to -1^-} Y = \text{"}\frac{1}{0^-}\text{"} = -\infty$$

vertical asymptotes $X=0, X=-1$



$X=0 \rightarrow$ impossible

$Y=0 \rightarrow X=-2$

$\boxed{52:38}$ $Y = \dfrac{x^3}{x^2-1} = \dfrac{x^3}{(x-1)(x+1)}$ for $x \neq 1, -1$

$$\left.\begin{array}{l} \lim\limits_{x \to 1^+} Y = \dfrac{\text{"}1\text{"}}{(0^+)(2)} = \dfrac{\text{"}1\text{"}}{0^+} = +\infty \\ \lim\limits_{x \to 1^-} Y = \dfrac{\text{"}1\text{"}}{(0^-)(2)} = \dfrac{\text{"}1\text{"}}{0^-} = -\infty \end{array}\right\} \text{vertical asymptote } x = 1$$

$$\left.\begin{array}{l} \lim\limits_{x \to -1^+} Y = \dfrac{\text{"}-1\text{"}}{(-2)(0^+)} = \dfrac{\text{"}-1\text{"}}{0^-} = +\infty \\ \lim\limits_{x \to -1^-} Y = \dfrac{\text{"}-1\text{"}}{(-2)(0^-)} = \dfrac{\text{"}-1\text{"}}{0^+} = -\infty \end{array}\right\} \text{vertical asymptote } x = -1$$

$$\lim_{x \to \infty} \frac{x^3}{x^2-1} = \lim_{x \to \infty} \frac{x}{1 - \frac{1}{x^2}} = \frac{\text{"}\infty\text{"}}{1-0} = \infty,$$

$$\lim_{x \to -\infty} \frac{x^3}{x^2-1} = \lim_{x \to -\infty} \frac{x}{1 - 1/x^2} = \frac{\text{"}-\infty\text{"}}{1-0} = -\infty,$$

so NO horizontal asymptotes;

$$\begin{array}{r l} & x + \dfrac{x}{x^2-1} \\ x^2-1 \, \big) & x^3 \\ & \underline{-(x^3 - x)} \\ & \quad x \end{array}$$

so tilted asymptote is $Y = x$;

intercept: $x=0$, $Y=0$