Let $f$ be the function given by $f(x) = \frac{2x-5}{x^2-4}$.

a. Find the domain of $f$.
b. Write an equation for each vertical and each horizontal asymptote for the graph of $f$.
c. Find $f'(x)$.
d. Write an equation for the line tangent to the graph of $f$ at the point $(0, f(0))$.

1985 AB 2 BC 1
A particle moves along the $x$-axis with acceleration given by $a(t) = \cos(t)$ for $t \geq 0$. At $t = 0$ the velocity $v(t)$ of the particle is 2 and the position $x(t)$ is 5.

a. Write an expression for the velocity $v(t)$ of the particle.
b. Write an expression for the position $x(t)$.
c. For what values of $t$ is the particle moving to the right? Justify your answer.
d. Find the total distance traveled by the particle from $t = 0$ to $t = \frac{\pi}{2}$.

1985 AB 3
Let $R$ be the region enclosed by the graphs of $y = e^x$, $y = e^{-x}$ and $x = \ln 4$.

a. Find the area of $R$ by setting up and evaluating a definite integral.
b. Set up, but do not integrate, an integral expression in terms of a single variable for the volume generated when the region $R$ is revolved about the $x$-axis.
c. Set up, but do not integrate, an integral expression in terms of a single variable for the volume generated when the region $R$ is revolved about the $y$-axis.

1985 AB 4 BC 3
Let $f(x) = (14 - x)^2$ and $g(x) = k^2 \sin \frac{\pi x}{2k}$ for $k > 0$.

a. Find the average value of $f$ on $[1,4]$.
b. For what value of $k$ will the average value of $g$ on $[0,k]$ be equal to the average value of $f$ on $[1,4]$?

1985 AB 5 BC 2
A balloon in the shape of a cylinder with hemispherical ends of the same radius as that of the cylinder. The balloon is being inflated at the rate of 261 cubic centimeters per minute. At the instant the radius of the cylinder is 3 centimeters, the volume of the balloon is 144 cubic centimeters and the radius of the
\[ f(x) = \frac{2x-5}{x^2-4} = \frac{2x-5}{(x+2)(x-2)} \]

(a) Find domain of \( f \): \((-\infty, -2) \cup (-2, 2) \cup (2, \infty)\)

(b) Find all Horizontal & Vertical Asymptotes

\[ \text{HA: } y = 0 \text{ because } \lim_{x \to \infty} f(x) = 0 \]

\[ \text{VA: } x = 2 \text{ because } \lim_{x \to 2^+} f(x) = \text{DNE} \quad (-\infty) \]

\[ x = -2 \text{ because } \lim_{x \to -2^+} f(x) = \text{DNE} \quad (+\infty) \]

(c) \[ f'(x) = \frac{(x^2-4) \frac{d}{dx}(2x-5) - (2x-5) \frac{d}{dx}(x^2-4)}{(x^2-4)^2} \]

\[ = \frac{2(x^2-4) - 2(2x-5)}{(x^2-4)^2} = \frac{2x^2 - 8 - 4x^2 + 10x}{(x^2-4)^2} = -2x^2 + 10x - 8}{(x^2-4)^2} \]

\[ f'(x) = \frac{-2(x^2 - 5x + 4)}{(x^2-4)^2} \]

(d) Find an equation of the line tangent to curve at \((0, f(0))\)

\[ f(0) = \frac{2(0)-5}{0^2-4} = \frac{5}{4} \]

\[ \text{point is } (0, \frac{5}{4}) \]

\[ f'(0) = \frac{-2(0^2 - 5(0) + 4)}{(0^2-4)^2} = \frac{-2(4)}{16} = \frac{-8}{16} = -\frac{1}{2} \]

\[ \text{equation is } y - \frac{5}{4} = -\frac{1}{2} (x-0) \]