And Now....

Deep Thoughts, By Jack Handey

"I bet the main reason the police keep people away from a plane crash is they don't want anybody walking in and lying down in the crash stuff, then, when somebody comes up, act like they just woke up and go "What was THAT?!"" - Jack Handey

Source:
https://sites.google.com/site/ashleylparrott/jackhandey.
UNIT 2 REVIEW Day 2

p. 216 # 1, 2, 3, 4, 5, 8, 10, 19, 20
\[ f(t) = \frac{t^2 - 3t + 2}{t - 3} \]

1. Domain: \( t \in \mathbb{R}, t \neq 3 \)

\[
\lim_{{t \to 3}} f(t) = -\infty \quad \lim_{{t \to 3^+}} f(t) = -\infty
\]

2. \( t \)-intercepts: \( f(0) = 0 \)

\[
0 = \frac{t^2 - 3t + 2}{t - 3}
\]

\[
0 = \frac{(t-2)(t-1)}{t-3}
\]

\( t = 2 \) or \( t = 1 \)

Oblique Asymptote: (Number 1 degree higher than \( y = \) constant)

\[
\frac{t}{t-3}\left(\frac{t^2 - 3t + 2}{t^2 - 3t}\right)
\]

\[
\therefore f(t) = t + \frac{2}{t - 3}
\]

Note: It's easier to take the derivative of this to get \( f'(t) \)

\[
f'(t) = \frac{(2t-3)(t-3) - (t)(t^2 - 3t + 2)}{(t-3)^2}
\]

\[= \frac{2t^2 - 6t - 3t^3 + 9 - t^3 + 3t - 2}{(t-3)^2}
\]

\[= \frac{2t^2 - 6t + 7}{(t-3)^2}
\]

\[f(t) = 0\]

\[0 = t^2 - 6t + 7\]

\[t = \frac{6 \pm \sqrt{36 - 4(7)}}{2} = \frac{6 \pm 2\sqrt{2}}{2}\]

\[t \approx 4.41 \text{ or } t \approx 1.59\]

\[\therefore f(4.41) \approx 4.41 + \frac{2}{4.41 - 3} \approx 5.83\]

\[f(1.59) \approx 0.17\]
From Geogebra:
Ex1: Find then classify the critical points of the function $f(x) = 3x^5 - 25x^3 + 60x$ using the 2nd derivative test.

Recall:

The 2nd Derivative Test:
At a local max, $f''(x) < 0$.
At a local min, $f''(x) > 0$.

$f'(x) = 15x^4 - 75x^2 + 60$
$f'(x) = 0$ to find critical values.
$f'(x) = 15(x^4 - 5x^2 + 4)$
$f'(x) = 15(x^2 - 4)(x^2 - 1)$
$0 = 15(x^2 - 4)(x^2 - 1)$
$x = \pm 2$ or $\pm 1$

Crit. points:
$f(2), f(-2), f(1), f(-1)$
$f(2) = 16$ $f(1) = 38$
$f(-2) = -16$ $f(-1) = -38$

The 2nd Deriv Test.
$f''(x) = 60x^3 - 150x$
$f''(-2) < 0$ $\therefore (-2, -16)$ is a local max.
$f''(2) > 0$ $\therefore (2, 16)$ is a local min.
$f''(1) < 0$ $\therefore (1, 38)$ is a local max
$f''(-1) < 0$ $\therefore (-1, -38)$ is a local min.
What to do with graphical holes.

\[ f(x) = \frac{x^3 - 3x^2 + 5x - 15}{x - 3} \]

\[ = \frac{(x^2 + 5)(x - 3)}{(x - 3)} \quad , \quad x \neq 3 \]

\[ f(x) = x^2 + 5 \quad , \quad x = 3 \]

\[ a. \ x \in \mathbb{R} \ \land x \neq 3 \]

\[ f(x) = \frac{(x+3)x}{(x+3)(x+3)} \]
\[ f(x) = \frac{5x}{(x-1)^2} \] 
show that \[ f'(x) = \frac{-5(x+1)}{(x-1)^3} \]
and \[ f''(x) = \frac{100(x+2)}{(x-1)^4} \]
\[ F(x) = (x-1) ^ {\frac{4}{3}} \]