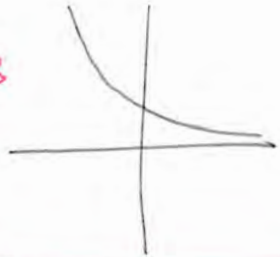
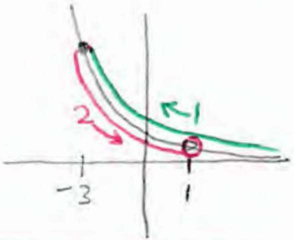
[2] [a] $y = 2^{-x}$ 3



3

[b] AS t GOES FROM $-\infty$ TO -2 TO ∞

x ∞ TO -3 TO 1^- 6



6

[3] f IS CONT ON $(-\infty, 3)$ AND $(3, \infty)$ SINCE f IS RATIONAL
AND ITS DOMAIN IS $x-3 \neq 0$
IE. $x \neq 3$

$f'(x) = -(x-3)^{-2} = -\dfrac{1}{(x-3)^2}$ 3, SO f IS DIFF ON $(-\infty, 3)$ AND $(3, \infty)$

SO f IS CONT ON $[-3, 1]$ 3 AND DIFF ON $(-3, 1)$ 3 SO MVT APPLIES 3

SO FOR SOME $c \in (-3, 1)$ 3, $f'(c) = -\dfrac{1}{(c-3)^2}$ 2 $= \dfrac{\frac{1}{1-3} - \frac{1}{-3-3}}{1 - -3}$

$$= \frac{-\frac{1}{2} + \frac{1}{6}}{4} \; 4 = \frac{-\frac{1}{3}}{4} = -\frac{1}{12} \; 2$$

$(c-3)^2 = 12 \to c - 3 = \pm 2\sqrt{3} \to c = 3 \pm 2\sqrt{3}$ 3

$c = 3 - 2\sqrt{3} \in (-3, 1)$ 3

$(\approx 3 - 2(1.7) = -0.4)$

[4] [b] $f' = 0$ 4 @ $x = -1, 1$ 4 (f' EXISTS FOR ALL x)

[c] $f' < 0$ 4 ON $(-\infty, -1)$ 6

[d] f' CHANGES FROM NEGATIVE TO POSITIVE 4
AT CRITICAL NUMBER $x = -1$, SO $x = -1$ 3 IS A LOCAL MIN 4 OF f

[e] f' DECREASING 4 ON $(0, 1)$ 6

[5] [a] x-INT $\to y=0 \to \underline{t^4-2t^2=0}$ 4

$t^2(t^2-2)=0 \to \underline{t=0,\pm 2}$ 3

$t=0 \to x=0$

$t=\sqrt{2} \to x=2-2\sqrt{2}<0$

$\underline{t=-\sqrt{2} \to x=2+2\sqrt{2}}$ 3 >0

$$\frac{dy}{dx}=\frac{\underline{4t^3-4t}\ 4}{\underline{2t-2}\ 4}=\frac{4t(t^2-1)}{2(t-1)}=2t(t+1)=\underline{2t^2+2t}\ 4$$

$$\left.\frac{dy}{dx}\right|_{t=-\sqrt{2}}=\underline{4-2\sqrt{2}}\ 3$$

$$\underline{y=(4-2\sqrt{2})(x-2-2\sqrt{2})}\ 3$$

[b] $$\frac{d^2y}{dx^2}=\frac{\underline{4t+2}\ 3}{\underline{2t-2}\ 3}=\frac{2t+1}{\underline{t-1}}\ 3$$

[6] $\lim_{x \to 0} \frac{x + \cos x - \sec x - \tan x}{x^2 + x - \sin x} = \lim_{x \to 0} \frac{1 - \sin x - \sec x \tan x - \sec^2 x}{2x + 1 - \cos x}$ 8 $\quad \frac{1-0-0-1}{0+1-1} \to \frac{0}{0}$

$\frac{0+1-1-0}{0+0-0} \to \frac{0}{0}$

$= \lim_{x \to 0} \frac{-\cos x - \sec x \tan x \tan x - \sec x \sec^2 x - 2 \sec x \sec x \tan x}{2 + \sin x}$ 10

$= \frac{-1-0-1-0}{2+0} = -1$ 3

[7] $f'(x) = \dfrac{x^{\frac{2}{3}} + 6x^{\frac{1}{3}} + 9}{2x} = \underline{\tfrac{1}{2}x^{-\frac{1}{3}} + 3x^{-\frac{2}{3}} + \tfrac{9}{2}x^{-1}}$ 6

$f(x) = \tfrac{1}{2}\cdot\tfrac{3}{2}x^{\frac{2}{3}} + 3\cdot 3x^{\frac{1}{3}} + \tfrac{9}{2}\ln|x| + C = \underline{\tfrac{3}{4}x^{\frac{2}{3}} + 9x^{\frac{1}{3}} + \tfrac{9}{2}\ln|x| + C}$ 8

$f(-1) = \underline{\tfrac{3}{4} - 9 + 0 + C = -2}$ 4

$C = 6\tfrac{1}{4} = \tfrac{25}{4}$

$f(x) = \underline{\tfrac{3}{4}x^{\frac{2}{3}} + 9x^{\frac{1}{3}} + \tfrac{9}{2}\ln|x| + \tfrac{25}{4}}$ 3

[8] $\csc^2 t = \cot^2 t + 1$ 6 $= \dfrac{1}{\tan^2 t} + 1$

$x^2 = \dfrac{1}{y^2} + 1$ 4 or $x^2y^2 = 1 + y^2$