1.

$f(x) = e^{(5\ln x)+x}$

$e^{\ln(x^5)}\ e^{(x)}$

$e^x x^5$

$(e^x)(x^5) + (e^x)(5x^4)$

a. $e^x(x^5+5x^4) \Rightarrow \boxed{x^4e^x(x+5)}$

$\frac{d}{dx}\left[\ln y = \ln(x+1)^{3/2} + \ln(x+8) - \ln(x+4)^{1/2}\right]$

$\frac{1}{y}y' = \frac{1}{(x+1)^{3/2}} + \frac{1}{x+8} - \frac{1}{(x+4)^{1/2}}$

b. $\boxed{y' = \left(\frac{1}{(x+1)^{3/2}} + \frac{1}{x+8} - \frac{1}{(x+4)^{1/2}}\right)\frac{(x+1)^{3/2}(x+8)}{\sqrt{x+4}}}$

$(1 + 1/9 - 1/2)$ $\quad \frac{1+9}{2}$ $\quad \left(\frac{1}{9}+\frac{1}{2}\right)\ \frac{9}{2}$

$f(x) = \frac{(x+1)^{3/2}(x+8)}{\sqrt{x+4}}$ $\quad \frac{2}{18}+\frac{9}{18}$

$\frac{11}{18}\cdot\frac{9}{2}$

$L(x) = f'(x)(x-x_1)+f(x_1)$ $\quad x_1 = 0$ $\quad 99/36$

$33/12 \Rightarrow 11/4$

c. $\boxed{L(x) = \frac{11}{4}(x-0)+\frac{9}{2}}$

$\frac{11}{4}\left(\frac{9}{2}\right)+\frac{9}{2}$ $\quad \frac{11}{8}+\frac{9}{2}$ $\quad \frac{11}{8}+\frac{36}{8} = \boxed{\frac{47}{8}}$

d.

2.

$m(t) = 2.8 + 3.5e^{-0.285t}$

$3158 = 2.8 + 3.5e^{-0.285t}$

$-2.8 \quad -2.8$

$\frac{3155.2}{3.5} = \frac{3.5e^{-0.285t}}{3.5}$

$\ln(901.49) = (e^{-0.285t})\ln$

$-\ln(901.49) = -0.285t$

$3.158 = 2.8 + 3.5e^{-0.285t}$

$\frac{0.358}{3.5} = \frac{3.5e^{-0.285t}}{3.5}$

$0.1 = e^{-0.285t}$

$\ln(0.1) = \ln(e^{-0.285t})$

$\ln(0.1) = -0.285t$

$8.08 = t$

1. 2029

$\lim_{t\to\infty}\left(2.8+3.5e^{-0.285t}\right)$

$2.8+3.5e^{-0.285(10000)}$

$2.8+3.5e^{-2850}$

b. 2.8

the radioactive substance will decay away while the granit stays

$m'(3) = \left(2.8+3.5e^{-0.285(3)}\right)(-0.285)$

c. $\boxed{m'(3) = 0.64}$ g/y

3.

$x = 8 \quad \frac{dx}{dt} = 4 \qquad A = xy(0.5)$

$y = 6 \quad \frac{dy}{dt} = 3$

$A = 24$

$A\frac{dA}{dt} = x\frac{dx}{dt}y\frac{dy}{dt}\cdot 0.5$

$\frac{d}{dx}[xy]\cdot(0.5)+0$

$288/24 = 12$ $\quad 8\cdot4\cdot6\cdot3\cdot0.5$

$32\cdot18\cdot0.5$

$32\cdot9 = 288$

a. $\boxed{\frac{dA}{dt} = 12\ ft/s}$

$z = \sqrt{x^2+y^2}$

$z\frac{dz}{dt} = \frac{d}{dx}\left[(x^2+y^2)^{1/2}\right]$

$\frac{d}{dt}\left[z^2 = x^2+y^2\right]$ $\quad z\frac{dz}{dt} = x\frac{dx}{dt}+y\frac{dy}{dt}$

$z = 10$ $\quad z$ $\quad z$

$\frac{dz}{dt} = \frac{x\frac{dx}{dt}+y\frac{dy}{dt}}{z}$ $\quad 8\cdot4+6\cdot3$ $\quad 32+18$

$\frac{50}{10}$

c. $\boxed{\frac{dz}{dt} = 5\ ft/s}$

MATH 425

4: $g(x) = (x-1)^{2/3}(x-6)^{-1}$ $[0, 6]$

$\frac{2}{3}(x-1)^{-1/3}(x-6) + (x-1)^{2/3}(x-6)^{-1}$

$= (x-6)\frac{2}{3}(x-1)^{-1/3} + \frac{(x-1)^{2/3}}{(x-6)}$

$6 \to 0$, $1 \to 0$

$6 \to$ ONE

$1 \to 0$

	$g^{2/3}$
	0

a. $x = 1, 6$

b. abs max = 0
abs min = -6

average roc = 1

c. $x = 3.851$

5. $h'(x) = (x+1)^2(2-x)$

	$-$		2	
$(x+1)^2$	+		+	+
$2-x$	+		+	−
	+		+	−
	dec	inc		dec

a.

$2(x+1)^1 \to (2x+2)(2-x) + (x+1)^2(1)$

$2x^2 + 4x + 4 + x^2 + 2x + 1$

$3x^2 + 4x + 5$

no roots

always concave up

$3(x^2+1)$

$(x^2+2x+1)(2-x)$

$2x^2 - x^3 + 4x - 2x^2 + 2 - x$

$f(x) = -x^3 + 3x + 2 \quad f'(x) = 3x^2 + 3$