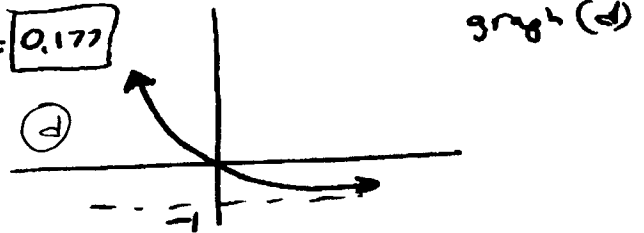


sect 4.1

- #1 (a) $5(5^3) = 5^4 = \boxed{625}$
 (b) $27^{2/3} = (27^{1/3})^2 = 3^2 = \boxed{9}$
 (c) $64^{3/4} = (64^{1/4})^3 = (\sqrt[4]{64})^3 = 8^3 = 8\sqrt{8} = \boxed{16\sqrt{2}}$
 (d) $81^{1/2} = \boxed{9}$
 (e) $25^{3/2} = (25^{1/2})^3 = 5^3 = \boxed{125}$
 (f) $32^{4/5} = (32^{1/5})^4 = 2^4 = \boxed{16}$

- #7 $f(x) = 2^{x-1}$
 (a) $f(3) = 2^{3-1} = 2^2 = \boxed{4}$
 (b) $f(1) = 2^{1-1} = 2^0 = \frac{1}{2^1} \approx \boxed{0.707}$
 (c) $f(-2) = 2^{-2-1} = 2^{-3} = \frac{1}{2^3} = \frac{1}{8} = \boxed{0.125}$
 (d) $f(-\frac{3}{2}) = 2^{-\frac{3}{2}-1} = 2^{-\frac{5}{2}} = \frac{1}{2^{5/2}} = \frac{1}{4\sqrt{2}} \approx \boxed{0.177}$

#17 $x^{3/4} = 8$
 $x = (8)^{4/3} = 2^4 = \boxed{16}$



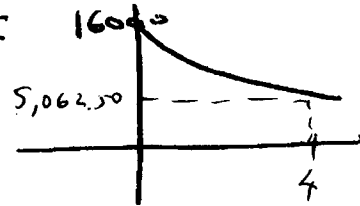
#17 $f(x) = 3^{-x} - 1$

#31 $P(t) = 252.12(1.011)^t$ $t=2$ (1992)

2008 (a) $P(18) = 252.12(1.011)^{18} \approx 307.0$

2012 (b) $P(22) = 252.12(1.011)^{22} \approx 320.7$

2008
2012

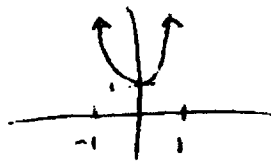


#34 $V(t) = 16000(\frac{3}{4})^t$
 $V(4) = 16000(0.75)^4 = 5,062.50$

Sect 4.2

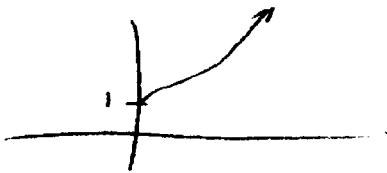
#7 $f(x) = e^{x^2}$

(d)



#9 $f(x) = e^{\sqrt{x}}$

(c)



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#25 $P = 1000$
 $r = 3\%$
 $t = 40 \text{ yr}$

n	$A = P(1 + \frac{r}{n})^{nt} \Rightarrow Pe^{rt}$
1	3,262.04
2	3,290.66
4	3,305.28
12	3,315.15
365	3,319.95
∞	3,320.12

#49 $P = \frac{0.83}{1 + e^{-0.2n}}$

$P(10) = \underline{0.731}$

$P(n) = 0.75 \Rightarrow 0.75 = \frac{0.83}{1 + e^{-0.2n}} \Rightarrow 1 + e^{-0.2n} = \frac{0.83}{0.75}$
 $e^{-0.2n} = \frac{0.08}{0.75}$

$\lim_{n \rightarrow \infty} \frac{0.83}{1 + e^{-0.2n}} = \underline{0.83}$

$-0.2n = \ln(0.08/0.75)$

$n = -5 \ln(0.08/0.75) \approx \underline{11.19 \approx 11}$

Sect 4.3

#7 $y = e^{-x^2}$

$y' = e^{-x^2} \cdot \frac{d}{dx}(-x^2) = \underline{-2x e^{-x^2}}$

#11 $f(x) = (x^2 + 1)e^{4x}$
 $f'(x) = (2x)e^{4x} + (x^2 + 1)e^{4x} \cdot 4$
 $= \underline{(4x^2 + 2x + 4)e^{4x}}$

#23 $x e^y - 10x + 3y = 0$
 $1 \cdot e^y + x e^y y' - 10 + 3y' = 0$
 $(x e^y + 3)y' = 10 - e^y$
 $y' = \frac{-e^y + 10}{x e^y + 3} =$

#43 $N = \frac{95}{1 + 8.5 e^{-0.12t}}$

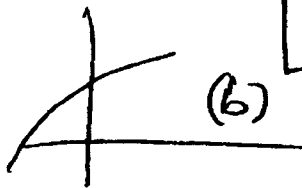
$N' = 95(-1)(1 + 8.5 e^{-0.12t})^{-2} (-1.02 e^{-0.12t})$ (a) $t=5$ $N' = \frac{969 e^{-0.6}}{(1 + 8.5 e^{-0.6})^2}$
 ≈ 1.66 words/min/week
(b) $N' \approx 230$ ($t=10$)
 $N' \approx 174$ ($t=30$)

Sect 4.4

#3 $\ln 0.2 = -1.6094\dots$

$e^{-1.6094\dots} = 0.2$

#11 $f(x) = \ln(x+2)$ shift left by 2



#37 $\ln [z(z-1)^2] = \ln z + \ln(z-1)^2 = \ln z + 2 \ln(z-1)$

#45 $3[\ln x + \ln(x+3) - \ln(x+4)] = 3 \ln \frac{x(x+3)}{x+4} = \ln \frac{x^3(x+3)^3}{(x+4)^3}$ or $\ln \left[\frac{x(x+3)}{x+4} \right]^3$

#83 $R = 0.32 \times 10^{-12} = 10^{-12} \left(\frac{1}{2}\right)^{t/5715}$

$0.32 = \left(\frac{1}{2}\right)^{t/5715}$

$\ln 0.32 = \frac{t}{5715} \ln \left(\frac{1}{2}\right) \Rightarrow t = \frac{5715 \ln 0.32}{\ln(1/2)} = \boxed{9394.6 \text{ yrs}}$

Sect 4.5

#3 $y = \ln x^2 = 2 \ln x$

$y' = 2 \cdot \frac{1}{x} = \frac{2}{x} \Big|_{x=1} = \frac{2}{1} = 2$

slope = 2

#7 $y = \ln(x^2 + 3)$

$y' = \frac{1}{x^2+3} \cdot 2x = \frac{2x}{x^2+3}$

#19 $y = \ln \sqrt[3]{\frac{x-1}{x+1}} = \frac{1}{3} \ln \frac{x-1}{x+1} = \frac{1}{3} \ln(x-1) - \frac{1}{3} \ln(x+1)$

$y' = \frac{1}{3} \cdot \frac{1}{x-1} - \frac{1}{3} \cdot \frac{1}{x+1} = \frac{1}{3} \left(\frac{(x+1) - (x-1)}{(x-1)(x+1)} \right) = \frac{2}{3(x-1)(x+1)} = \frac{2}{3(x^2-1)}$

#55 $4x^3 + \ln y^2 + 2y = 2x$

$4x^3 + 2 \ln y + 2y = 2x$

$12x^2 + \frac{2}{y} y' + 2y' = 2$

$y' = \frac{2 - 12x^2}{\frac{2}{y} + 2} = \frac{1 - 6x^2}{\frac{1}{y} + 1} = \frac{y(1 - 6x^2)}{1 + y}$

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Sec 4.6

#11 ^{226}Ra $\frac{\text{Half-Life}}{1,599 \text{ yr}}$ $\frac{Y_0}{10 \text{ gms}}$ $\frac{Y_{1000}}{?}$ $\frac{Y_{10000}}{?}$

$$y = 10 \left(\frac{1}{2}\right)^{t/1599}$$
$$y(1000) = \left(\frac{1}{2}\right)^{1000/1599} = 6.482 \text{ gm}$$
$$y(10000) = \left(\frac{1}{2}\right)^{10000/1599} = 0.131 \text{ gms}$$

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#23

(a) $y(0) = 150$) $\times 3$
 $y(5) = 450$ =
 $y(10) = 450 \times 3 = \underline{\underline{1350}}$

$$y(t) = 150(2)^{kt}$$
$$y(5) = 150(2)^{5k} = 450$$
$$2^{5k} = 3$$

$$5k \ln 2 = \ln 3$$
$$k = \frac{\ln 3}{5 \ln 2} = \underline{\underline{0.317}}$$

$$300 = 150(2)^{0.317t}$$

(b) $2^1 = 2 = 2^{0.317t}$

$$\Rightarrow 0.317t = 1 \quad \Rightarrow \quad t = \underline{\underline{3.15 \text{ hrs}}}$$

no