4.1 : 2, 6, 14, 18, 20, 28, 30, 36

2. (a) $\left(\frac{1}{5}\right)^3 = \frac{1}{125}$

(b) $\left(\frac{1}{8}\right)^{1/3} = \sqrt[3]{\frac{1}{8}} = \frac{1}{2}$

(c) $64^{2/3} = \left(\sqrt[3]{64}\right)^2 = (4)^2 = 16$

(d) $\left(\frac{5}{8}\right)^2 = \frac{25}{64}$

(e) $100^{3/2} = \left(\sqrt[2]{100}\right)^3 = (10)^3 = 1000$

(f) $4^{5/2} = \left(\sqrt[2]{4}\right)^5 = (2)^5 = 32$

6 (a) $(4^3)(4^2) = (64)(16) = 1024$

(b) $\left(\frac{1}{4}\right)^2(4^2) = \left(\frac{1}{4}\cdot 4\right)^2 = (1)^2 = 1$

(c) $(4^6)^{1/2} = 4^3 = 64$

(d) $\left[(8^{-1})(8^{2/3})\right]^3 = (8^{-1/3})^3 = 8^{-1} = \frac{1}{8}$

14 $\left(\frac{1}{5}\right)^{2x} = 625$

$5^{-2x} = 5^4$

$-2x = 4$

$x = -2$

18. $(x+3)^{4/3} = 16$

$(x+3) = (16)^{3/4}$

$x+3 = \left(\sqrt[4]{16}\right)^3$

$x+3 = 8$

$x = 5$

20. $f(x) = 3^{-x/2} = \left(\frac{1}{3}\right)^{x/2}$

Exponential curve.

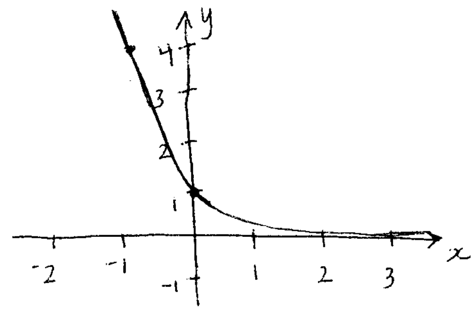
Passes through $(0,1)$, $(1, 1/\sqrt{3})$, $(2, 1/3)$

Horizontal asymptote : $y = 0$

Therefore, it matches graph (c)

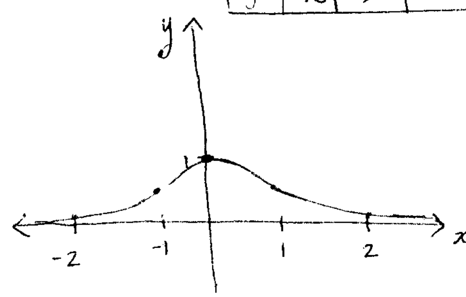
28. $f(x) = \left(\frac{1}{4}\right)^x = 4^{-x}$

x	-2	-1	0	1	2
$f(x)$	16	4	1	1/4	1/16



30. $y = 2^{-x^2}$

x	-2	-1	0	1	2
y	1/16	1/2	1	1/2	1/16



36.

$V(t) = 64{,}000(2)^{t/15}$

(a) 5 years

$V(5) = 64{,}000(2)^{5/15}$

$= 64{,}000(2)^{1/3}$

$\approx \$80{,}634.95$

(b) 20 years

$V(20) = 64{,}000(2)^{20/15}$

$= 64{,}000(2)^{4/3}$

$\approx \$161{,}269.89$

4.2 8, 12, 18, 22, 32, 40, 42

8. $e^{-1/x} = \sqrt{e}$

$e^{-2/x} = e$

$\ln(e^{-2/x}) = \ln(e)$

$-2/x = 1$

$x = -2$

12 $x^{-2} = 2/e^2$

$x^2 = (e^2/2)$

$x = \pm\, e/\sqrt{2} = \pm \dfrac{\sqrt{2}e}{2}$

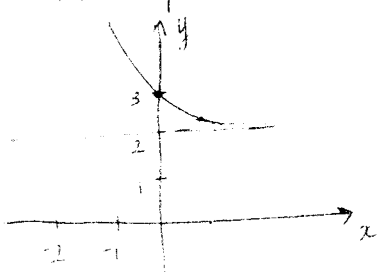
18. $f(x) = -e^{x} + 1$

Graph (a).

(Passes through (0,0))

22 $f(x) = e^{-x} + 2$

Intercept (0, 3)



32 P = \$2500, r = 5%, t = 20 years

n	1	2	4	12	365	Continuous compounding
A	6633.24	6712.66	6753.71	6781.60	6795.24	6795.70

$A = P(1 + r/n)^{nt}$

$= 2500\left(1 + \dfrac{0.05}{n}\right)^{20n}$

Continuous compounding: $A = Pe^{rt}$

$= 2500e^{(0.05)(20)}$

40. $r_{eff} = (1 + r/n)^n - 1$, $r = 0.075$

(a) $r_{eff} = \left(1 + \dfrac{0.075}{1}\right)^1 - 1 = 0.075$ or 7.5%

(b) $r_{eff} = \left(1 + \dfrac{0.075}{2}\right)^2 - 1 \approx 0.0764$ or 7.64%

(c) $r_{eff} = \left(1 + \dfrac{0.075}{4}\right)^4 - 1 \approx 0.0771$ or 7.71%

(d) $r_{eff} = \left(1 + \dfrac{0.075}{12}\right)^{12} - 1 \approx 0.0776$ or 7.76%

42.

$P = \dfrac{A}{(1 + r/n)^{nt}}$

$= \dfrac{21{,}154.03}{\left(1 + \dfrac{0.078}{12}\right)^{(12)(4)}} \approx \$15{,}500.00$

4.3: 4, 10, 16, 18, 20, 24, 28, 32, 38

4. $y = e^{-2x}$

$y' = -2e^{-2x}$

$y'(0) = -2$

10. $g(x) = e^{\sqrt{x}} = e^{x^{1/2}}$

$g'(x) = e^{\sqrt{x}}\left(\frac{1}{2}x^{-1/2}\right) = \frac{e^{\sqrt{x}}}{2\sqrt{x}}$

16. $y = x^2e^x - 2xe^x + 2e^x$

$y' = x^2e^x + 2xe^x - 2xe^x - 2e^x + 2e^x = x^2e^x$

18. $g(x) = e^{x^3}$ $\quad (-1, 1/e)$

$g'(x) = e^{x^3}(3x^2)$

$g'(-1) = 3e^{-1}$

$y - 1/e = 3/e\,(x+1)$

$y = 3/e\,x + 3/e + 1/e = 3/e\,x + 4/e$

20. $y = \frac{x}{e^{2x}}$ $\quad (1, 1/e^2)$

$y' = x(-2e^{-2x}) + e^{-2x}$

$y'(1) = -2/e^2 + 1/e^2 = -1/e^2$

$y - 1/e^2 = -1/e^2\,(x-1)$

$ye^2 - 1 = -x + 1$

$ye^2 + x - 2 = 0$ or $y = \frac{2-x}{e^2}$

24. $e^{xy} + x^2 - y^2 = 10$

$(y + x\,dy/dx)e^{xy} + 2x - 2y\,dy/dx = 0$

$\frac{dy}{dx}(xe^{xy} - 2y) = -ye^{xy} - 2x$

$\frac{dy}{dx} = \frac{-ye^{xy} - 2x}{xe^{xy} - 2y} = \frac{-y(10 - x^2 + y^2) - 2x}{x(10 - x^2 + y^2) - 2y} = \frac{x^2y - y^3 - 2x - 10y}{xy^2 - x^3 + 10x - 2y}$

28. $f(x) = (3 + 2x)e^{-3x}$

$f'(x) = (3+2x)(-3e^{-3x}) + 2e^{-3x}$

$= e^{-3x}(-9 - 6x + 2) = -e^{-3x}(6x+7)$

$f''(x) = -e^{-3x}(6) + (6x+7)(3e^{-3x})$

$= 3e^{-3x}(-2 + 6x + 7) = 3e^{-3x}(6x+5)$

32. $f(x) = xe^{-x}$

$f'(x) = -xe^{-x} + e^{-x} = e^{-x}(1-x)$

$f'(x) = 0$ when $x = 1$

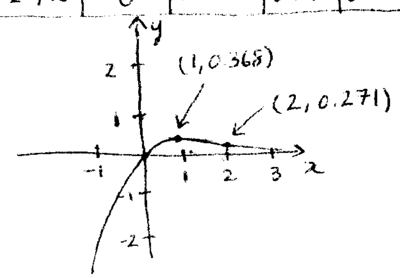
$f''(x) = e^{-x}(-1) + (1-x)(-e^{-x})$

$= -e^{-x}[1 + (1-x)] = e^{-x}(x-2)$

Since $f''(1) < 0$, we have a relative maximum at $(1, e^{-1})$

$f''(x) = 0$ when $x = 2$ and we have a point of inflection at $(2, 2e^{-2})$

x	-1	0	1	2	3
$f(x)$	-2.718	0	0.368	0.271	0.149



38. $N = \frac{95}{1 + 8.5e^{-0.12t}}$, $\quad N' = \frac{96.9e^{-0.12t}}{(1 + 8.5e^{-0.12t})^2}$

(a) When $t = 5$, $N' = 1.66$ words/min/week

(b) When $t = 10$, $N' = 2.30$ words/min/week

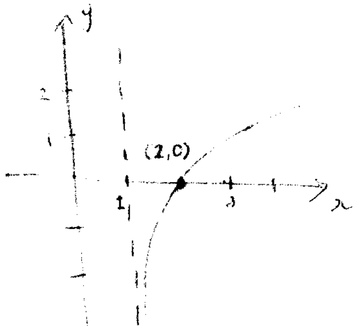
(c) When $t = 30$, $N' = 1.74$ words/min/week

4.4 : 12, 13, 16, 20, 24, 28

12. The graph is a logarithmic curve that passes through the point (2, 0) with a vertical asymptote at $x = 1$. Therefore, it matches graph (a).

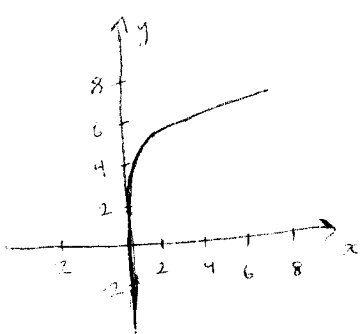
13. $y = \ln(x-1)$

x	1.5	2	3	4	5
y	-0.69	0	0.69	1.10	1.39



16. $y = 5 + \ln x$

x	0.5	1	2	3	4
y	4.31	5	5.69	6.10	6.39



20. $f(x) = e^x - 1$

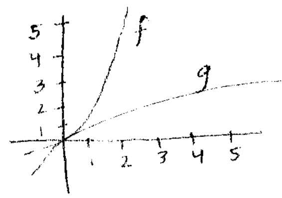
$g(x) = \ln(x+1)$

$f(g(x)) = f(\ln(x+1))$

$= e^{\ln(x+1)} - 1 = (x+1) - 1 = x$

$g(f(x)) = g(e^x - 1)$

$= \ln((e^x - 1) + 1) = \ln e^x = x$



24. $\ln e^{2x-1} = 2x - 1$

28. $-8 + e^{\ln x^3} = -8 + x^3$

$= x^3 - 8$