

MATHEMATICS 201-009-50

Precalculus

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XIII – Exponential Functions

1. Sketch the graph of the following function. State the domain, range, intercepts (only the y-intercept for j, k, l and n) and asymptotes.

a) $f(x) = -4^x$

b) $f(x) = 3^{-x}$

c) $f(x) = 1 + 2^x$

d) $f(x) = 1 - 2^x$

e) $f(x) = 3^{x+1}$

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

g) $f(x) = 4^{-x} + 3$

h) $f(x) = \left(\frac{1}{2}\right)^{x+2} - 2$

i) $f(x) = 3^{2-x} - 1$

j) $f(x) = e^{2x} + 1$

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

l) $f(x) = 3e^{x-1} + 2$

m) $f(x) = 2^{|x|}$

n) $f(x) = \left(\frac{1}{2}\right)^{3-x} + 4$

2. After t years, the value of a car that cost \$25 000 is modeled by

$$V(t) = 25000\left(\frac{3}{4}\right)^t$$

- a) What is the value of the car two years after purchase?
b) Graph the function.

3. A sky diver jumps off an airplane. The air resistance he experiences is proportional to his velocity. It can be shown that the velocity of the sky diver at time t is then given by

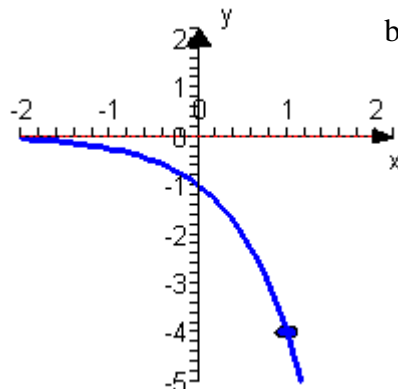
$$v(t) = 98(e^{-0.1t} - 1)$$

where t is in seconds and v in meters per second.

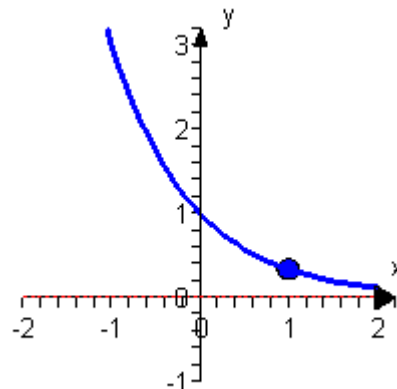
- a) Find the initial velocity of the diver.
b) What is the velocity of the diver after 5 seconds?
c) Sketch a graph of the velocity.
d) The maximum velocity of a falling object with air resistance is called its terminal velocity. From the graph in(c), find the terminal velocity of the diver.

ANSWERS

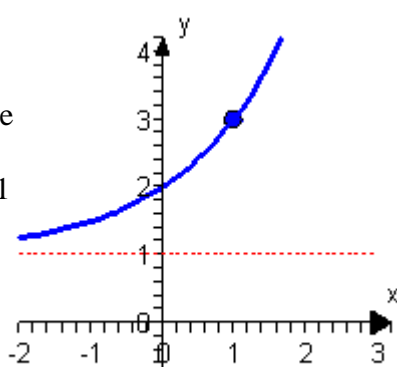
1. a) D: \mathbb{R}
 R: $(-\infty, 0)$
 x-ints: none
 y-int: -1
 H.A.: $y = 0$



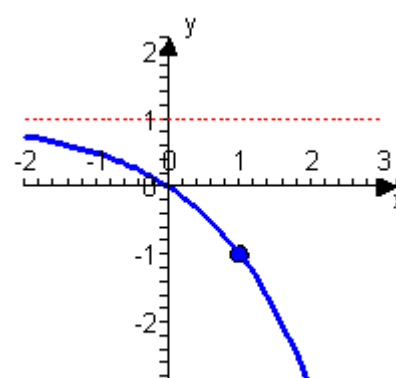
- b) D: \mathbb{R}
 R: $(0, \infty)$
 x-ints: none
 y-int: 1
 H.A.: $y = 0$



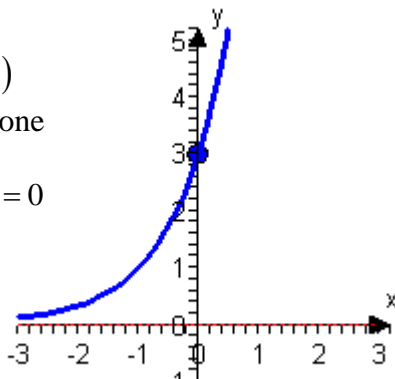
- c) D: \mathbb{R}
 R: $(1, \infty)$
 x-ints: none
 y-int: 2
 H.A.: $y = 1$



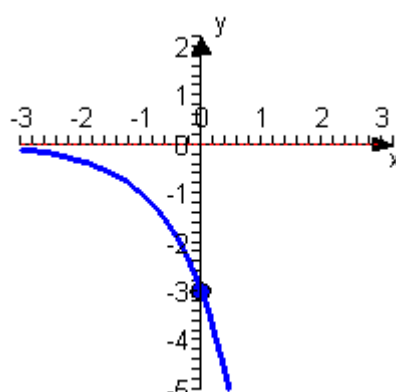
- d) D: \mathbb{R}
 R: $(-\infty, 1)$
 x-ints: 0
 y-int: 0
 H.A.: $y = 1$



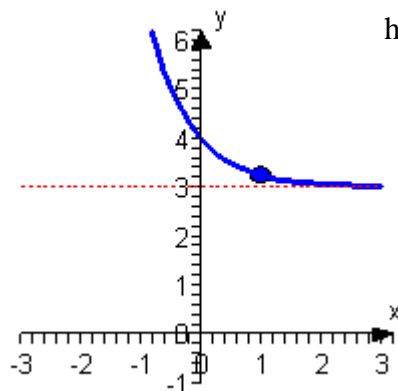
- e) D: \mathbb{R}
 R: $(0, \infty)$
 x-ints: none
 y-int: 3
 H.A.: $y = 0$



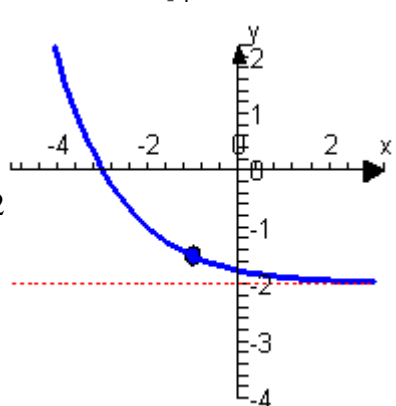
- f) D: \mathbb{R}
 R: $(-\infty, 0)$
 x-ints: none
 y-int: -3
 H.A.: $y = 0$



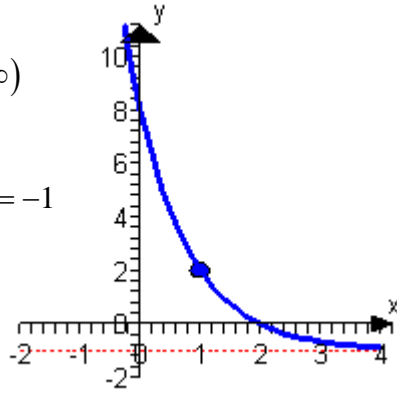
- g) D: \mathbb{R}
 R: $(3, \infty)$
 x-ints: none
 y-int: 4
 H.A.: $y = 3$



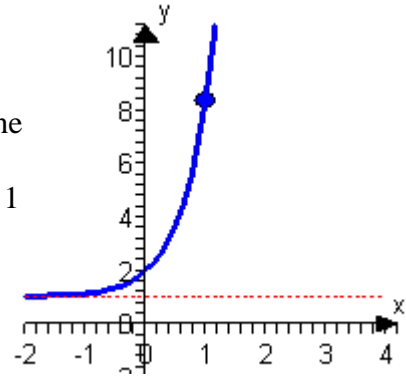
- h) D: \mathbb{R}
 R: $(-2, \infty)$
 x-ints: -3
 y-int: $-\frac{7}{4}$
 H.A.: $y = -2$



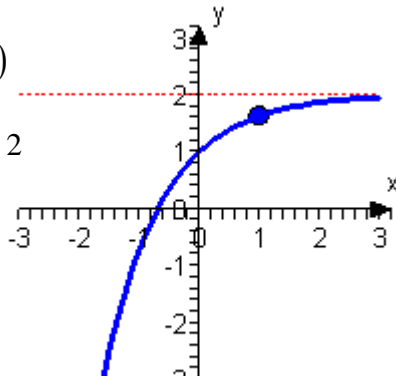
- i) D: \mathbb{R}
 R: $(-1, \infty)$
 x-ints: 2
 y-int: 8
 H.A.: $y = -1$



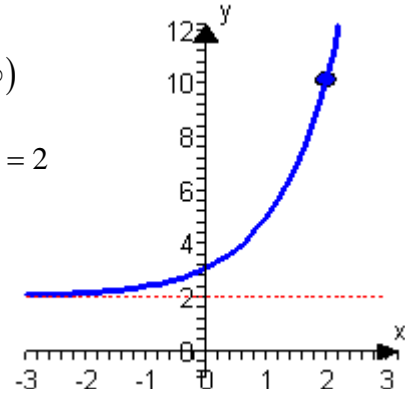
- j) D: \mathbb{R}
 R: $(1, \infty)$
 x-ints: none
 y-int: 2
 H.A.: $y = 1$



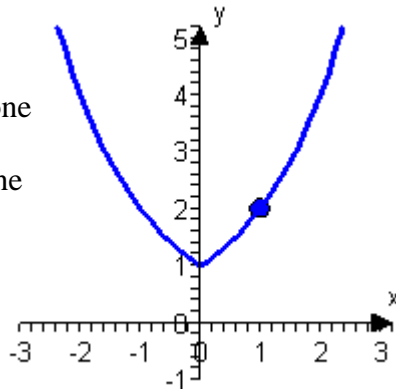
- k) D: \mathbb{R}
 R: $(-\infty, 2)$
 y-int: 1
 H.A.: $y = 2$



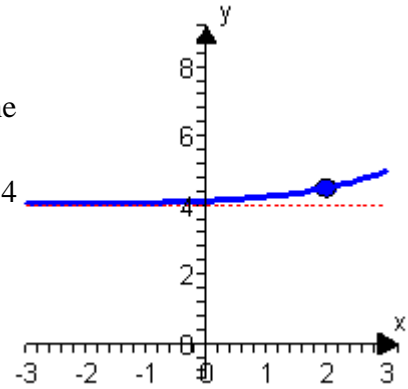
- l) D: \mathbb{R}
 R: $(2, \infty)$
 y-int: 3
 H.A.: $y = 2$



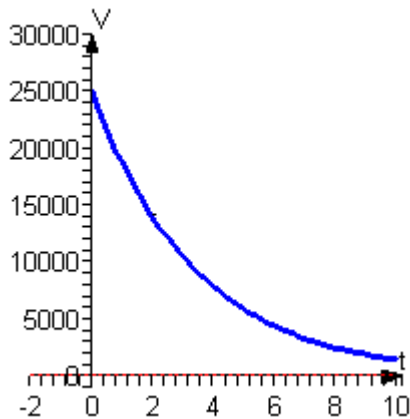
- m) D: \mathbb{R}
 R: $(1, \infty)$
 x-ints: none
 y-int: 1
 H.A.: none



- n) D: \mathbb{R}
 R: $(4, \infty)$
 x-ints: none
 y-int: $\frac{33}{8}$
 H.A.: $y = 4$



2. a) \$14062.50



3. a) 0 m/s
 b) -38.56 m/s
 d) -98 m/s

