In-class exercises 1

50.004 Introduction to Algorithms

Exercise 1

Given that $f(x) = x + 5$ and $g(x) = x + 1$

1) $f(x) = O(g(x))$ (T/F)
2) $g(x) = \Omega(f(x))$ (T/F)

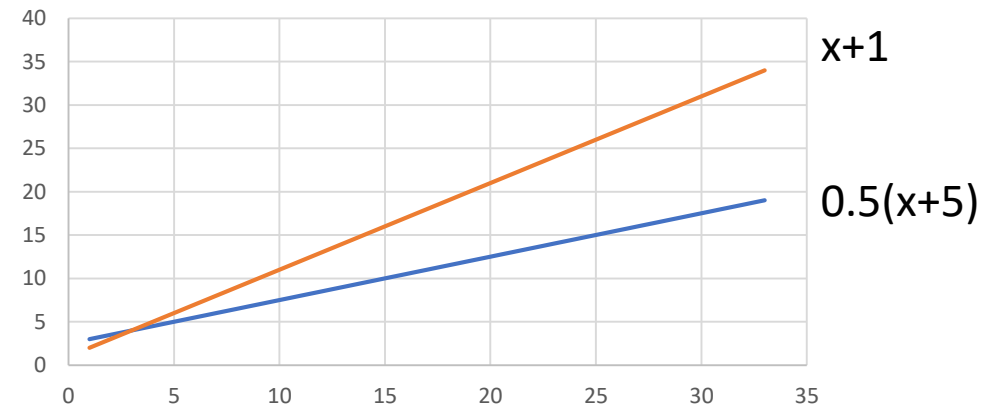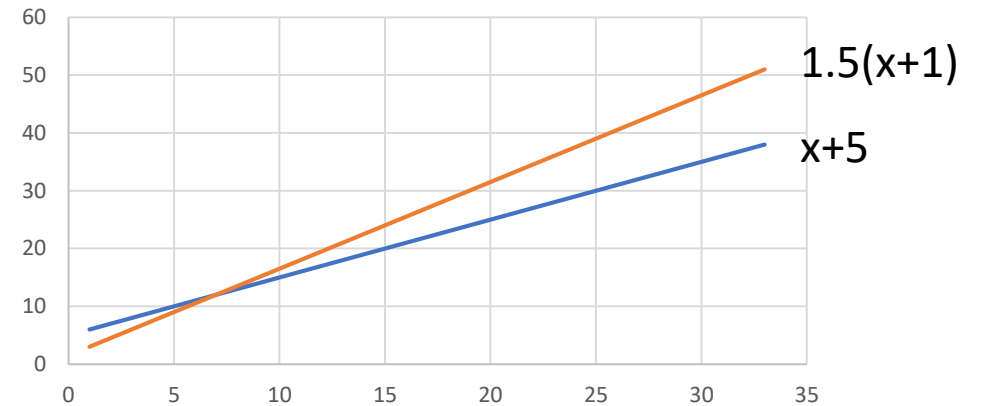# Exercise 1

Given that $f(x) = x + 5$ and $g(x) = x + 1$

1) $f(x) = O(g(x))$ (T/F)
2) $g(x) = \Omega(f(x))$ (T/F)

Solution:

1) True

2) True

1.5(x+1)

x+5

x+1

0.5(x+5)

Exercise 2

Given that $f(x) = x^2$ and $g(x) = x^2 + 2x$

1) $f(x) = O(g(x))$ (T/F)
2) $f(x) = \Omega(g(x))$ (T/F)

Exercise 2

Given that $f(x) = x^2$ and $g(x) = x^2 + 2x$

1) $f(x) = O(g(x))$ (T/F)
2) $f(x) = \Omega(g(x))$ (T/F)

Solution:

1) True
2) True

Exercise 3

Given that $f(x) = x^2$ and $g(x) = 2000x^2 + 500x + 123$

1) $f(x) = \Omega(g(x))$ (T/F)
2) $g(x) = \Theta(f(x))$ (T/F)

Exercise 3

Given that $f(x) = x^2$ and $g(x) = 2000x^2 + 500x + 123$

1) $f(x) = \Omega(g(x))$ (T/F)
2) $g(x) = \Theta(f(x))$ (T/F)

Solution:

1) True
2) True

Exercise 4

Given that $f(x) = 1234x^2$ and $g(x) = x^3$

1) $f(x) = \Theta(g(x))$ (T/F)
2) $f(x) = O(g(x))$ (T/F)
3) $g(x) = \Omega(f(x))$ (T/F)

Exercise 4

Given that $f(x) = 1234x^2$ and $g(x) = x^3$

1) $f(x) = \Theta(g(x))$ (T/F)
2) $f(x) = O(g(x))$ (T/F)
3) $g(x) = \Omega(f(x))$ (T/F)

Solution:
1) False
2) True
3) True

Exercise 5

Given that $f(x) = 5x$ and $g(x) = \log x$
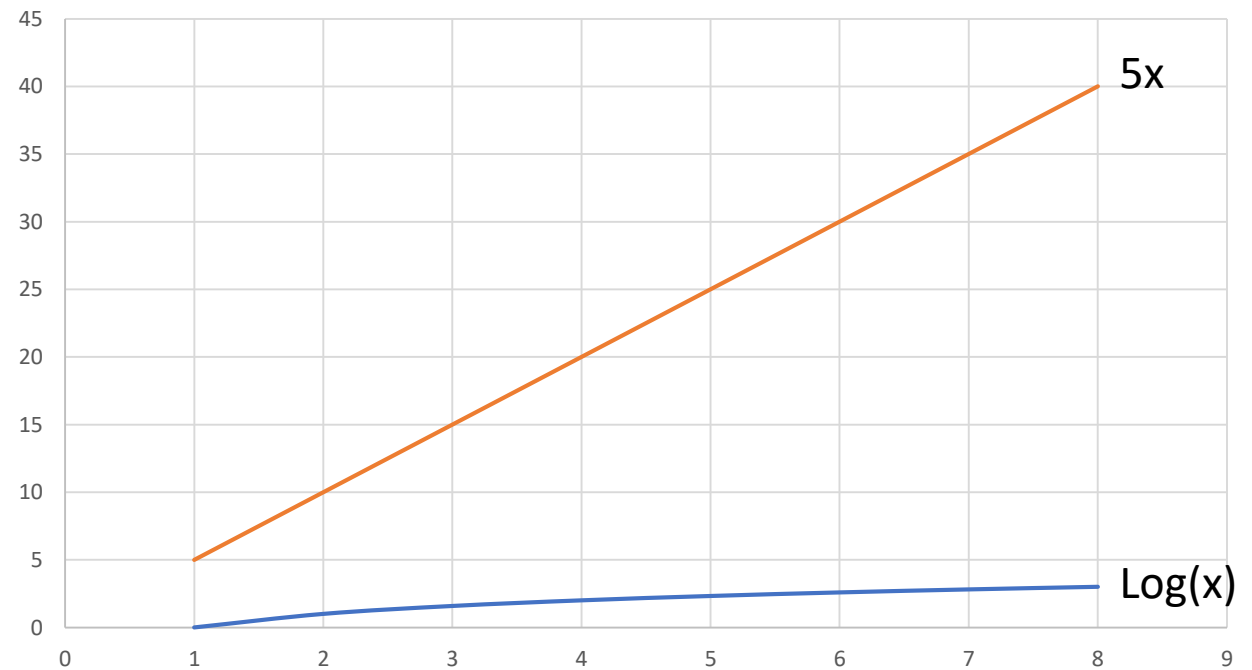
1) $f(x) = [?](g(x))$

Hint: Sketch the functions to visualize

Exercise 5

Given that $f(x) = 5x$ and $g(x) = \log x$

1) $f(x) = [\Omega](g(x))$

Hint: Sketch the functions to visualize

Exercise 6

Given that $f(n) = n \log n$ and $g(n) = n^2$

1) $f(n) = [?](g(n))$

Hint: Sketch the functions to visualize

Exercise 6

Given that $f(n) = n \log n$ and $g(n) = n^2$

1) $f(n) = [O](g(n))$

Hint: Sketch the functions to visualize