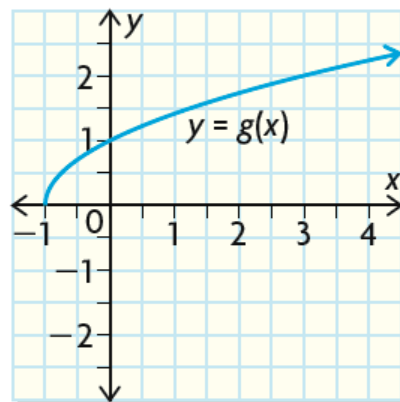


Final exam – Functions 3U

Question 1 [C]

For the function shown in the graph, determine each value.

- a) $g(3)$
- b) $g(-1)$
- c) x if $g(x) = 1$
- d) the domain and range of $g(x)$



Question 2 [K/U + C]

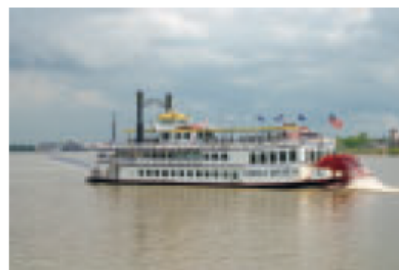
Simplify the expression $v(t) \times h(t) = (-10t + 5)(-5t^2 + 5t + 2.5)$.

Question 3 [K/U]

Factor $f(x) = x^3 + x^2 + x + 1$.

Question 4 [A]

The cost, $c(x)$, in dollars per hour of running a certain steamboat is modelled by the quadratic function $c(x) = 1.8x^2 - 14.4x + 156.5$, where x is the speed in kilometres per hour. At what speed should the boat travel to achieve the minimum cost?



Question 5 [K/U]

Evaluate.

a) 5^{-3}

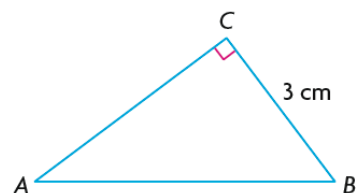
b) $(-4)^{-2}$

c) -3^{-4}

Question 6 [T + C]

$\triangle ABC$ is a right triangle with side lengths of 3 cm, 4 cm, and 5 cm.

If $CB = 3$ cm and $\angle C = 90^\circ$, which trigonometric ratio of $\angle A$ is the greatest?



Question 7 [T]

Prove that $1 + \cot^2 \theta = \csc^2 \theta$ for all angles θ between 0° and 360° except 0° , 180° , and 360° .

Question 8 [K/U]

In $\triangle ABC$, determine $\angle A$ to the nearest degree if $a = 55$ cm, $b = 26$ cm, and $c = 32$ cm.

Question 9 [A+C]

The function $j(t) = 4.1 \sin(64.7t)^\circ + 5.8$, where t is time in years since May 1992 and $j(t)$ is the number of applications for jobs each week (in hundreds), models demand for employment in a particular city.

- Using graphing technology in DEGREE mode and the WINDOW settings shown, graph the function and then sketch the graph.
- How long is the employment cycle? Explain how you know.
- What is the minimum number of applications per week in this city?
- Calculate $j(10)$, and explain what it represents in terms of the situation.

Question 10 [A + T]

Philip borrows \$540 for 85 days by taking a cash advance on his credit card. The interest rate is 26%/a simple interest. How much will he need to pay back at the end of the loan period, and how much interest will he have paid?

Question 11 [C+A]

Monica wants to start a business and needs to borrow some money. Her bank will charge her 6.4%/a compounded quarterly. Monica wants to repay the loan in 5 years, but doesn't want the amount she pays back to be more than \$20 000. What is the maximum amount that she can borrow and how much interest will she pay if she doesn't pay anything back until the end of the 5 years?

Question 12 [K/T]

- a) Hans plans to invest \$1000 at the end of each 6-month period in an annuity that earns 4.8%/a compounded semi-annually for the next 20 years. What will be the future value of his annuity?
- b) You plan to invest $\$R$ at regular intervals in an annuity that earns $i\%$ compounded at the end of each interval. What will be the future value, FV , of your annuity after n intervals?