

1. Notes about the examination:

- The examination should take about an hour and a half.
- Part of the exam is “multiple choice”, and part of it is “show your work”. (You will **not** need a ScanTron[®]).
- The exam will be taken in the Testing Center [please go [here](#) for more information], and will be open Thursday, January 26 and Friday, January 27.
- You will have a choice of doing 10 out of 12 multiple-choice questions (worth 4 points each), and 6 out of 8 show-your-work problems (worth 10 points each). You must **SHOW YOUR WORK** where appropriate to receive full credit for a problem.
- Please do all of your work on the white paper provided – the only things that should be on the examination paper itself are your name and (possibly) circled answers.
- **No cell-phone calculators** will be allowed in the Testing Center!
- Good luck (if you are depending on luck)!

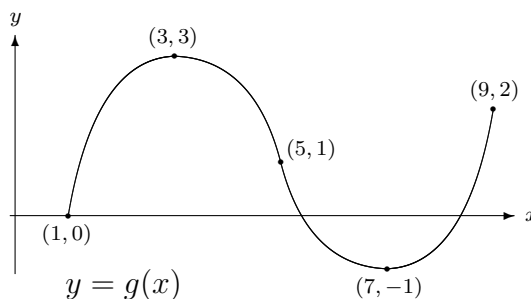
2. Definitions:

Chapter 1: function, domain, range, value, {independent, dependent} variable, arrow diagram, graph, Vertical Line Test, piecewise-defined, absolute value, step functions, {even, odd} function, increasing, decreasing, angles, circle, arc length, area of a sector, standard position, {positive, negative} angles, 6 trig functions, identities, graphs of trig functions, model, linear function, empirical model, family, polynomials, coefficient, degree, {constant, linear, quadratic, cubic} function, power functions, root functions, reciprocal function, rational function, {horizontal, vertical, oblique} asymptote, algebraic function, trigonometric functions, amplitude, period, frequency, phase shift, {exponential, logarithmic} function, base, natural {exponential, logarithmic} function, {sum, difference, product, quotient} of functions, composition of functions, {translations, reflections, stretches/compressions} of functions, CAS, viewing window, $\{x, y\}$ -interval, tick marks, scale variables, zooming in and out, zoom factors, aspect ratio, pixel, resolution, false information, exponential function, laws of exponents, $e \approx 2.7182818284590\dots$, natural exponential e^x , one-to-one, Horizontal Line Test, inverse function, cancellation equations, logarithmic function, laws of logarithms, natural logarithm $\ln(x)$, change-of-base formula, inverse {sine, cosine, tangent} function

3. Find values of a function

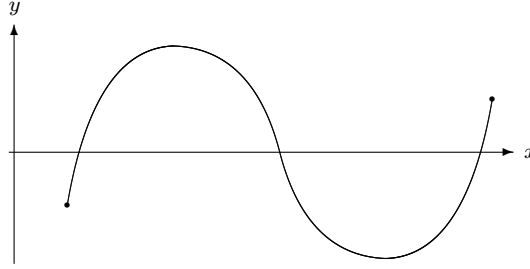
ex: If $f(x) = 2x - 3$, what is $f(-6)$?

ex: Find $g(5)$.



4. Use the Vertical Line Test to determine if a graph represents a function

ex:



5. Use function notation effectively

ex: If $\ell(x) = 2x - x^4 + \sqrt{1-x}$, find $\ell(0)$, $\ell(1)$, $\ell(-3)$, $\ell(2-x)$ and $\ell(b)$

6. Find the domain and range of a function

ex: Find the domain and range of the function $g(x) = 2 \cdot |x + 1|$

ex: (see #3 above)

7. Convert degrees to radians (and vice versa)

ex: -412°

ex: $\frac{8\pi}{15}^{\text{R}}$

8. Solve circle questions

ex: The radius of a circle is $r = 4.6$ m. If the interior angle is $\theta = \frac{11\pi}{12}$, what is the

a) arc length s ?

b) area A ?

9. Solve trig equations

ex: $\sin(2\theta) = \cos(2\theta)$

10. Solve trig inequalities

ex: $\sin^2(\theta) \leq \frac{1}{2}$

11. Build functions

ex: Find an expression for the cubic function $f(x)$ such that $f(0) = f(1) = f(3) = 0$ and $f(2) = -4$.

12. Calculate the sum, difference, product, quotient and composition of two functions

ex: For the functions $h(x) = 2x - 1$ and $j(x) = 1 - x^2$, form $(h+j)(x)$, $(h \cdot j)(x)$, and $\left(\frac{h}{j}\right)(x)$

13. Determine the domain of a composition of two functions

ex: For $f(x) = \frac{1}{4-x}$ and $g(x) = \ln(x+2)$, find the domain of $(g \circ f)(x)$

14. Graph transformed functions

ex: Graph the function $k(x) = 2 \cdot \sqrt{x+1} - 3$

15. Determine an appropriate graphing window (and x - and y -scales) for a given function

ex: $f(x) = x^2 + 0.02 \sin(50x)$

16. Simplify exponent expressions

ex: Use the laws of exponents to simplify $\left(\frac{x^2 \cdot y^{-3} \cdot z^{-2}}{x^{-4} \cdot y^4 \cdot z^3}\right)^{-1}$

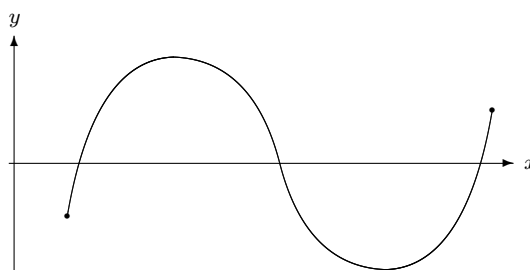
17. Use exponential functions properly

ex: A bacteria culture starts with 500 bacteria, and doubles in size every half hour.
How many bacteria are there after 45 minutes?

18. Determine if a function is one-to-one

ex: $h(x) = \sin(x)$ on $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

ex:



19. Find a formula for the inverse of a function (when it exists)

ex: $f(x) = \frac{e^x}{1 + 2e^x}$

20. Use properties of logarithms

ex: Expand $\log\left(\frac{y^3 \sqrt{z^3}}{x^2}\right)$

ex: Collect $2 \log(a) - \frac{1}{3} \log(b) - 3 \log(c) + \frac{1}{2} \log(d)$ into a single logarithm

21. Solve logarithm equations

ex: $5 \log_4(2x - 6) = 10$

22. Solve logarithm inequalities

ex: $\log_6(3x + 5) + 7 > 9$

23. Use the “triangle method” to simplify trig expressions

ex: $\tan(\sin^{-1}(x))$