BECA / Huson / 11.1 IB Math SL Name:
14 December 2017

Take home test: Exponential functions

44 pts

Open notes, open book (including Wikipedia and other online materials). No online calculators or human help. Write your solutions on loose leaf paper, except for the two graphs. Due Monday at the beginning of class.

Interest rate calculations

Use the formula for simple interest: $i = Prt$ where P is the principal amount of the loan or investment in dollars; r is the interest rate, usually per year but also sometimes per month; t is the amount of time, in units consistent with the rate; and i is the amount of interest in dollars. (round to the nearest cent)

1. 5% interest per annum, \$10,000 principal, one year — 1 pt
2. 7% interest per annum, \$1,500 principal, six months — 1 pt
3. The annual interest rate required to earn \$200 on \$50,000 principal in one month. — 1 pt

Functions, exponents, logs

Simplify each expression. Leaving no negative or fractional exponents.

4. $5x^{-3}y^2 \div 2x^3y^2$ — 1 pt
5. $\sqrt[5]{x^{-10}y^2}$ — 1 pt
6. $\left(xy^{\frac{1}{2}}\right)^4$ — 1 pt
7. $\log_3 27$ — 1 pt
8. $\log 5 + \log 20$ — 1 pt
9. $\log_5 75 - \log_5 3$ — 1 pt
10. $(2x-7)(x^2-2x-3)$ — 1 pt
11. Let $f(x) = 2x - 1$ and $g(x) = -x^2 + x$
    (a) Find $f^{-1}(x)$. — 1 pt
    (b) Find $(g \circ f)(1)$. — 1 pt
12. Consider the equation $2x^2 + (k+1)x = -18$, where k is a real number. Find the values of k for which the equation has two equal real solutions. — 4 pts

Exponential and quadratic functions. (calculator oriented)

13. Let $f(x) = 2x^2 - 5x - 4$.

    (a) Write down the coordinates of the vertex. 1 pt

    (b) Hence or otherwise, express the function in the form $f(x) = 2(x - h)^2 + k$. 1 pt

    (c) Solve the equation $f(x) = 0$. 2 pts

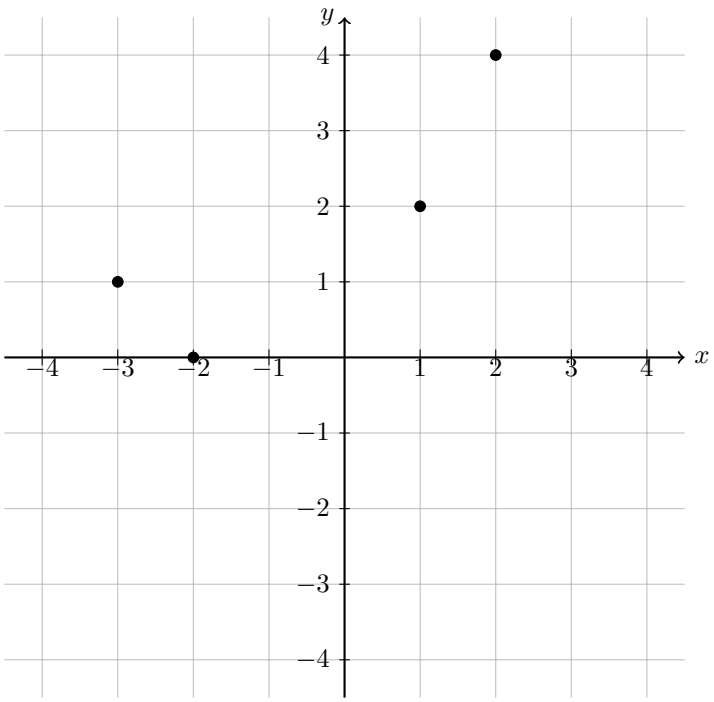
14. Given the exponential function $f(x) = 1.5e^{(0.03x)}$.

    (a) Write down $f(0)$. 1 pt

    (b) Find $f(2)$. 1 pt

    (c) Solve for x such that $f(x) = 5$. 2 pts

15. The diagram below shows the graph of a function f, composed of four points.



    (a) Write down the value of $f(1)$. 1 pt

    (b) Write down the domain of f. 1 pt

    (c) Write down the range of f. 1 pt

    (d) Write down the value of $f^{-1}(1)$. 1 pt

    (e) Sketch the inverse of f, f^{-1}, on the grid above. 1 pt

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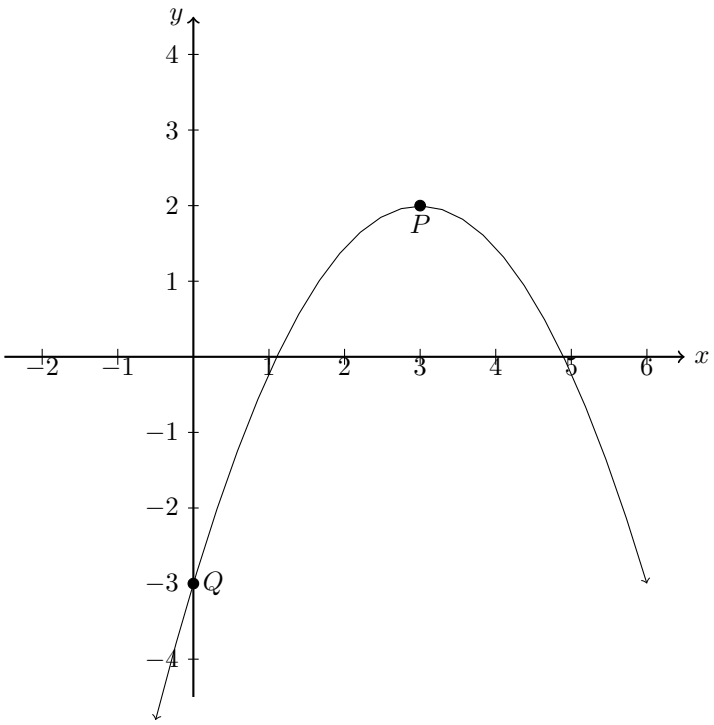
16. Let f be a quadratic function. Part of the graph of f is shown below.
The vertex is $P(3, 2)$ and the y-intercept is $Q(0, -3)$.



(a) Write down the equation of the axis of symmetry. 1 pt

(b) The function f can be written in the form $f(x) = a(x - h)^2 + k$.
Write down the value of h and of k. 2 pts

(c) Show that $a = -\frac{5}{9}$. 2 pts

(d) Find the roots of the function. 2 pts

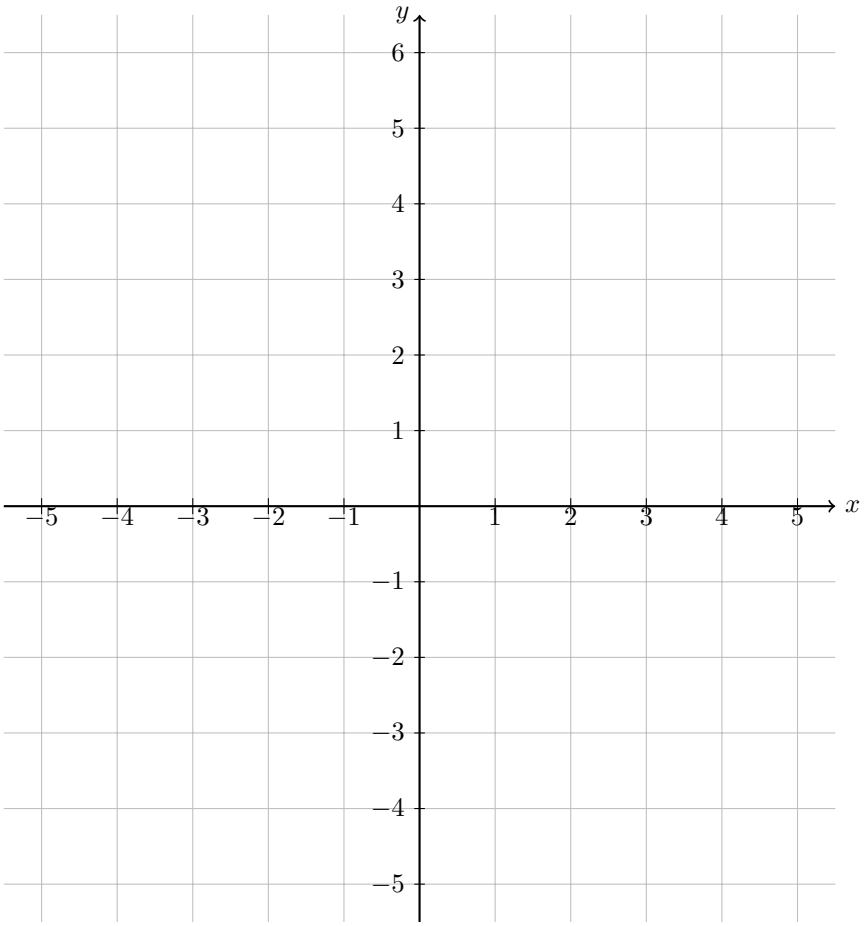
17. Consider the function $f(x) = x^2 + 2x + 2$.

(a) Sketch the graph of f, for $-3 \leq x \leq 1$. 3 pt

(b) This function can also be written in the form $f(x) = (x - p)^2 + 1$.
Write down the value of p. 1 pt

(c) The graph of g is obtained by reflecting the graph of f in the x-axis, followed by a translation of $(0, 4)$.
Show that $g(x) = -x^2 - 2x + 2$. 2 pts

(d) The graphs of f and g intersect at two points.
Write down the x-coordinates of these two points. 2 pts



Honor pledge

I have not received human help with this test, nor have I used calculators (including Desmos) except for an approved graphing calculator. Signed: