**FINALS 1**

TOSSUPS

1. **Grassberger developed a lattice model of these phenomena that uses critical exponents of 4/3 and 5/36 to characterize percolation transitions. Models of these phenomena describe two types of equilibria: DFEs and EEs, and their stability depends on whether R sub zero is greater or less than 1. Most models of these phenomena assume the removal rate, symbolized gamma, to be constant. A common model of these phenomena may be modified to append an "M" compartment and an "E" compartment. The** (\*) SIR model is the basic deterministic compartmental model of these phenomena, and studies of these phenomena often use a number that represents the ratio between expected secondary incidents and one primary incident. That is the basic reproduction number. Studies of these phenomena generally divide groups into susceptible, infective, and recovered individuals. For 10 points, identify these phenomena, which are widespread occurrences of infectious diseases.
ANSWER: **epidemics** [accept **pandemics**]

2. **The second movement of this work ends with the entire orchestra holding a B flat-D flat dyad. Towards the beginning of that movement of this work, the low strings and the woodwinds hold the same B flat-D flat dyad as a solo vocalist enters singing the word "Mamo." This work's second movement features a recurring melodic fragment of an eighth note, dotted quarter note, whole note rhythm with the pitches [READ SLOWLY] "E-G sharp-F sharp." This symphony begins with the double basses playing a 24-bar theme in the E Aeolian mode that develops into a canon with eight parts. This symphony was popularized by a** (\*) 1991 London Sinfonietta recording featuring Dawn Upshaw as the soprano soloist. Each movement of this symphony is set to a lament written by a woman, including a prayer to the Virgin Mary found scrawled on the wall of a Gestapo jail. For 10 points, name this most famous symphony by Polish composer Henryk Gorecki.
ANSWER: *Symphony of Sorrowful Songs* [or **Gorecki** Symphony No, **3**; or **Gorecki's Third** Symphony]

3. **According to a myth from this country, days are longer in summer because the attendants of the sun goddess pull her chariot slowly so they can have more time to flirt with her. In another story from this country, a god enters the womb of a woodsman's wife and becomes the couple's son. That god obtains a self-playing lute in an underwater kingdom that he reaches using a rhinoceros horn. Myths from this country are frequently told through the art of water puppetry. The wife of a farmer from this country is impregnated by a footprint and gives birth to a giant warrior who ascends to heaven on an iron horse, becoming one of the** (\*) Four Immortals. Heroes from this country include a dragon who fathers the human race on the fairy Au Co, and a man who climbs a glowing *banyan* tree to find the missing hilt for a blade given to him by a fisherman. For 10 points, name this home country of a dynastic founding narrative that ends with a turtle taking back the sword Heaven's Will from Le Loi.
ANSWER: **Vietnam**

4. **This scientist names a phenomenon in which the stagnation temperature depends only on Mach number and adiabatic index. This scientist is the first alphabetical namesake of a phenomenon that forms characteristic "fingers" when the Atwood number is close to zero. In Lagrangian mechanics, the force of friction is given by the negative velocity gradient of this scientist's namesake dissipation function. This scientist neglected the effects of viscosity and surface tension in deriving a model of** (\*) bubble cavitation generalized by Plesset. The interface between two fluids of different densities is subject to an instability named for this scientist and Taylor. His namesake number quantifies whether heat transfer occurs mainly through conduction or convection. For 10 points, identify this scientist whose namesake scattering makes the sky appear blue.
ANSWER: Lord **Rayleigh** [or John William **Strutt**, 3rd Baron Rayleigh; accept **Rayleigh** flow, **Rayleigh**-Taylor instability, **Rayleigh** dissipation function, **Rayleigh**-Plesset equation, **Rayleigh** number, or **Rayleigh** scattering]

5. **This philosopher authored a text on education that warned readers not to teach children "inert ideas," which are disjointed or unhelpful facts that have no application to culture or real life. Michel Weber is an interpreter of this philosopher who titled a text after this philosopher's "pancreativism." This author of "The Aims of Education" defined a unit that was called "all window" in contrast to Leibniz's "windowless" monads. He's not Henri Bergson, but this philosopher championed creativity as the ultimate category in his metaphysical system, which he described as a "philosophy of (\*)** organism." This philosopher's idea that the universe consists entirely of "occasions of experience" can be found in his book *Process and Reality*. This philosopher is the alphabetically later author of a text that was demonstrated to be incomplete by Kurt Godel. For 10 points, name this philosopher who worked with Bertrand Russell to write the *Principia Mathematica*.
ANSWER: Alfred North **Whitehead**

6. **The final couplet of this work vows, "May that man that hath the Muses scorned alive, nor dead, be ever of a Muse adorned." A popular English translation of this work was written in the 1700s by William Mickle. An oft-excerpted digression in this work is narrated by a condemned woman who laments that she will not be able to raise her children. The "Fair Inez" episode appears in this work, as does a monster who emerges out of a dark cloud and claims to have been a spurned lover of Thetis. The protagonist goes to the Isle of (\*)** Love after Monsayeed warns him that Catual, an emissary from the court of Samorin, plans to capture him. Book V of this work introduces a giant named Adamastor who lives off the Cape of Good Hope. In this work, Bacchus and Venus argue whether or not the Gods should aid a ship's journey to Calicut, For 10 points, name this Luis Vaz de Camoes work that fictionalizes the adventures of Vasco de Gama, the national epic of Portugal.
ANSWER: The ***Lusiads*** [or *Os **Lusiadas***]

7. **Kingma et al. introduced a variant of this algorithm that adds estimates of biased and corrected first and second moments. Schaul et al. introduced an adaptive variant of it that requires a good estimate of the Hessian, while SMORMS3 is a simpler hybrid of that variant and RMSProp, a version of this algorithm introduced in an oft-cited lecture slide by Geoffrey Hinton. Hogwild! is a lock-free implementation of an asynchronous version of this algorithm, while Nesterov and Rumelhart et al. each introduced variants that use momentum. (\*)** Stochastic approaches to this algorithm perform each step with a small sample or minibatch from a dataset and form the basis for optimization of deep neural networks. For 10 points, Adam and AdaGrad are variants of what simplest first-order optimization algorithm, which finds a local minimum for a function by taking steps proportional to and in the direction of highest negative slope?
ANSWER: **gradient descent** [or **steepest descent**, accept **SGD**]

8. **Description acceptable. Prior to its demolition, one of these locations provided the set for the climactic scene of the Gene Kelly film *The Devil Makes Three*. In 2007, John Barsamia sold a rare custom Columbus Globe he had acquired at one of these places. The path to a teahouse at one of them was the planned site of a sniper assassination mission called Operation Foxley. Traudl Junge worked in many of these locations, one of which housed a conference room that was destroyed by a briefcase bomb. The (\*)** 101st Airborne claims to be the first to reach the Eagle's Nest, a mountainside home built at one of these complexes that also contained the Berghof. The Göring Telegram was transmitted to the last of these places, while Claus von Stauffenberg targeted one called the Wolf's Lair in the 20 July Plot, or Operation Valkyrie. For 10 points, name these command centers that included a bunker in Berlin where Eva Braun was married on April 29, 1945, the day before she and her husband died.
ANSWER: **Führer Headquarters** [or **Hitler**'s **Headquarters**; accept equivalents; prompt on individual examples]

9. **In September 2014 and September 2015, respectively, this man signed bills creating Enhanced Infrastructure Financing Districts and Community Revitalization Authorities, both of which re-establish powers previously held by the redevelopment agencies that this politician dissolved in 2012. This man lost a 2015 legislative fight to impose a 50% target for reduction of oil use after pressure on fellow Democrats from the Western States Petroleum Association. This politician opposed a plan in 2015 to use a "split roll," which separates reassessment of commercial and residential property, to reform (\*)** Proposition 13, an initiative passed against his objections during his first term. This governor defeated his 2014 opponent Neel Kashkari 66% to 19%, and promised to use his fourth term to institute dramatic greenhouse gas reduction targets, carry out the Bay Delta Conservation Plan, and begin construction on high-speed rail. For 10 points, name this governor of California.
ANSWER: Edmund Gerald "**Jerry**" **Brown** Jr. [prompt on "Brown"]

10. One essay defines this period through government inaction, the distribution of wealth and entitlements, and the common law baseline. That essay by Cass Sunstein reframes this period as one rooted in a constitutional requirement of neutrality. Early in this period, Rufus Peckham wrote that a law that restricted dealings with marine insurance companies was unconstitutional. During the later years of this 40-year period, its policies were championed by Butler, McReynolds, Sutherland, and Van Devanter, collectively known as the (*) Four Horsemen. *Allgeyer v. Louisiana* began this period, which ended when the Three Musketeers were joined by Owen Roberts in a case that upheld a minimum wage law, *West Coast Hotel v. Parrish*. This period was characterized by the use of substantive due process to protect liberty of contract, as in the case from which this period takes its name. For 10 points, identify this era of Supreme Court history named for a 1905 case about bakers in New York.
ANSWER: _Lochner_ era [accept _Lochner_ v. New York; prompt on any specific times between 1897 and 1937]

11. A policeman in this novel begins a relationship with a woman who runs an insane asylum while investigating a man with "a bladder the size of a watermelon" who desecrates a number of churches. One character in this novel hangs a geometry textbook from a clothesline as a part of a Duchamp-inspired experiment. That man in this novel is the professor Amalfitano. In this novel's third section, a reporter for *Black Dawn* goes to Detroit to interview the barbecue enthusiast and former Black Panther Barry Seaman before he is sent to cover a (*) boxing match in Mexico. A love triangle in this work develops among Liz Norton, Pelletier, and Espinoza, three literary critics who travel to Mexico, where they learn about the countless murders of young women while on their search for the reclusive author Benno von Archimboldi. For 10 points, name this mammoth novel set in the fictional Mexican city of Santa Teresa, a work by Roberto Bolaño.
ANSWER: _2666_

12. Karaites believe that the aravot nahal should be a part of *this* rather than used inside of it, while Rabbi Yose says that one of *these* can be made in either a bottom-up or top-down way. The treatise in the Mishnah named for *this* is the sixth in the mo'ed order, allows a two-poster bed but not a four-poster bed in this place, and notes that it may not use a preexisting colonnade. A reception is held in this place during Simchat Beit ha-Sho'evah. Prayers recited in these places include the phrase "tzivanu leishev ba-[*this*]," while the (*) ushpizin are the seven guests ritually welcomed into them. Apartments in Israel often have terraced or offset balconies because only the top one of these is valid if one is built atop another. The s'chach, which may consist of pine branches or palm leaves but not straw, is the roof of this structure. For 10 points, name these structures in which Jews eat, sleep, and celebrate for the seven or eight days of their namesake autumn holiday.
ANSWER: **sukkot** [accept **sukkah**, prompt on "feast of booths," "booths," or "tabernacles"]

13. An essential characteristic of these devices is the generation of multiple non-discrete Townsend avalanches that propagate along an anode wire. Those avalanches always generate pulses of the same magnitude, meaning that these devices cannot give information about energy. These devices are operated in a voltage range where the gradient of the ion current is flat, known as their "plateau." Variants of the principal component of these devices include pancake and windowless types. That principal component of these devices is a (*) gas-filled tube that was initially co-developed by Walther Müller. A disadvantage of these devices is their propensity for giving falsely low readings due to ionization events occurring during their dead time. An end-window tube is necessary to detect alpha particles and weak beta particles using these devices. For 10 points, name these survey instruments commonly used to detect levels of ionizing radiation and named for a German physicist.
ANSWER: **Geiger counter**s [accept **Geiger-Müller** tubes in power; prompt on **gaseous ionization detector**s; prompt on **ionization chamber**s]

14. One character in this play sentences a girl to be given a fake scepter and crown, then put into a boat and set adrift with three days' worth of bread and water. Another character in this play attempts to hide the fact that she is a "town lady" by having a maid supply her with French words to use in her conversations at court. In the opening scene, two characters sing, "we loved and we loved, as long as we could," and lament a "foolish" vow. A man who fails to see through his wife's pageboy disguise describes women who "if their necessities and ours were known…have more need of two than we of one," at the end of this play's (*) "grotto scene." In this play, the fisherman Hermogenes reveals a jewel and a letter from Eudoxia to prove that it is Palmyra, not Leonidas, who is the child of Polydamas, the king of Sicily. For 10 points, name this play in which Palamede and Rhodophil romance each other's wives, a comedy by John Dryden that shares its name with a series by William Hogarth.
ANSWER: _**Marriage à la Mode**_

15. This artist turned the Philadelphia Museum of Art into a "circus" of simultaneous video screenings, readings, and performances, whose locations were in constant flux as determined randomly by computer. This curator of the *Rolywholyover* project arranged drawings of seeds, animal tracks, and nests from the journal of Henry David Thoreau into an etching structured as haiku poetry. While an alphabetically later artist applied paint to the wheel, this man drove a Ford Model A over a 22-foot scroll of paper to form the title *Automobile Tire Print*, which imitated Far Eastern scroll painting. This man was influenced by (*) Robert Rauschenberg's *White Paintings*, a set of completely white canvases, to create what he described as "my silent piece." That work was also influenced by a visit to Harvard's anechoic chamber, and reflects the influence of Zen Buddhism and chance on this artist's works. For 10 points, name this American artist who is best known as the avante-garde composer of *4'33"*.
ANSWER: John Milton **Cage**, Jr.

16. A ruler of this non-Scottish dynasty died when he accidentally rode his horse off a cliff while trying to escape a siege at night. This dynasty employed a company of mercenaries commanded by one of its former prisoners, Reverter de la Guardia. According to some accounts, the five shields on the coat of arms of a foreign king who defeated this dynasty in battle represent five of this dynasty's kings. This dynasty won a battle that gained its common name because so many soldiers died that the ground became slippery with blood. A regional branch of this dynasty called the (*) Banu Ghaniya held out for more than 50 years after it fell to a revolt of the Masmuda tribe, who were led by Ibn Tumart. This dynasty won the Battle of Sagrajas during the partitioned rule of Abu Bakr ibn Umar and Yusuf ibn Tashfin, in addition to losing the Battle of Ourique to Alfonso I of Portugal in 1139. For 10 points, name this Berber dynasty of Morocco and southern Spain that preceded the Almohads.
ANSWER: **Almoravid** dynasty

17. Shapes described in this poem include a "witch on broomstick, ostrich, hourglass," each of which contains a "scrap of highly colored Evidence the Law must put together." This poem's speaker recalls his marionettes, one of which was a "sidelit goosegirl…play[ing] Guinevere as well as Gunmoll Jean." This poem describes the gradual formation of the image of "a Sheik with beard and flashing sword hilt" and also remarks, "Quite a task, putting together Heaven, yet we do." A character in this poem tells the narrator of "her French hopes, her German fears." This poem was published in the collection *Divine Comedies*, and ends with the comfort of (*) "shade and fiber, milk and memory." Its speaker "spent the last days…ransacking Athens" for Rilke's German version of Valéry's "Palme," and works with his Alsatian governess, whom he calls "Mademoiselle," to solve a jigsaw puzzle. For 10 points, name this poem by James Merrill about memory and shifting languages.
ANSWER: "**Lost in Translation**"

18. The Stars and Stripes are interwoven with the images of a black man and a white couple in a painting by this artist called *The Flag Is Bleeding*. Another painting of the American flag by this artist shows the word "Die" over the stars and replaces the stripes with the N-word. This artist showed Cassie Louise Lightfoot soaring through the night sky above the George Washington Bridge in the background of a work in which a family shares a rooftop dinner. This artist of *Tar Beach* depicted a black woman and her daughters leaping in front of the *Mona Lisa* in *Dancing at the Louvre*. The same woman, Willa Marie Simone, poses as one of the models for *Les Demoiselles d'Avignon* in (*) *Picasso's Studio*, part of this artist's *The French Collection, Part I*. Her most famous work has brown and yellow sections showing stylized portraits of men and women, as well as white sections that verbally tell a story. For 10 points, name this black artist of narrative quilts like *Who's Afraid of Aunt Jemima?*
ANSWER: Faith **Ringgold** [or Faith Willi **Jones**]

19. The term structure of this quantity is plotted on the yield curve, which is the subject of the expectations hypothesis. This quantity's parity names a condition in which the differential between a country's forward exchange rate and another country's spot exchange rate makes it such that no arbitrage occurs. Two companies may transition from fixed to floating forms of this quantity or vice versa using this quantity's namesake "swap" derivative. The "zero lower bound" problem occurs when a form of this quantity is at or near (*) zero. This quantity is plotted against income level in the IS-LM curve. The "risk-free" version of this quantity is a useful input in pricing stock options. A near zero value for this quantity may signify a liquidity trap. The "real" form of this quantity is set equal to the "nominal" form minus inflation rate in the Fisher equation. For 10 points, name this quantity that denotes how much you must pay to borrow money.
ANSWER: **interest rate**

20. While traveling under the pseudonym "Countess of Hohenembs," this ruler's wife was killed by a man whose original target was Philippe, Duke d'Orléans. That wife encouraged this emperor's close relationship with the actress Katharina Schratt so the latter could keep him company while she was away. Maximilian O'Donnell stopped an assassination attempt on this emperor by János Libényi, and the Votive Church in his capital was built in commemoration. Alexander von Bach helped centralize this man's empire early in his reign, during which he joined the League of the (*) Three Emperors. This husband of Elisabeth, or "Sisi," was father-in-law to Mary Vetsera, found dead in a hunting lodge at Mayerling after an apparent murder-suicide involving her husband, Crown Prince Rudolf. He became emperor after Felix of Schwarzenberg advised the feeble-minded Ferdinand I, to abdicate in 1848. For 10 points, name this ruler of Austria-Hungary whose heir, until 1914, was Franz Ferdinand.
ANSWER: **Franz Joseph I** of Austria

BONUSES

1.  The title of this collection is from a poem that describes "mountains racing to the moon" and ends with the image of the speaker "stomping my feet for warmth on the everlasting snow." For 10 points each:
    [10] Name this collection whose title figure is told that "we've got Shakespeare there" in the previously mentioned poem, "Notes from a Nonexistent Himalayan Expedition."
    ANSWER: *Calling Out to Yeti* [or *Wołanie do Yeti*]
    [10] *Calling Out to Yeti* was written by this Polish Nobel laureate, who also wrote the collections *The People on the Bridge* and *The End and the Beginning*, which contains her poem "Love at First Sight."
    ANSWER: Wisława **Szymborska**
    [10] The much earlier poet Adam Mickiewicz wrote this work, considered to be the national epic of Poland. In it, the title character falls in love with Zosia, a member of a rival family.
    ANSWER: *Pan Tadeusz* [or *Sir Thaddeus*]

2.  A group of ten people blacklisted by this industry included Dalton Trumbo. For 10 points each:
    [10] Name this industry whose early tycoons included Samuel Goldwyn, Louis Mayer, and the Warner brothers.
    ANSWER: American **film** industry [or **movie** industry; or **motion picture** industry; or **Hollywood**]
    [10] Hollywood grew more political during the 1960s, as actresses like this one joined protest movements. She was photographed sitting at a Vietcong anti-aircraft battery during a 1972 visit to Hanoi.
    ANSWER: Jane **Fonda**
    [10] After the "Hollywood 10" debacle, 48 film executives gathered at this location to formulate a group response to communism in the industry. In the resulting "statement" named for this location, all of the Hollywood studios vowed not to knowingly employ communists.
    ANSWER: **Waldorf** Astoria New York [or the **Waldorf** Statement]

3.  Answer the following about famous adagios, for 10 points each:
    [10] This American composer of *Knoxville: Summer of 1915* and the opera *Vanessa* is probably best known for his *Adagio for Strings*.
    ANSWER: Samuel **Barber**
    [10] The Adagio in G Minor credited to this 18th-century Venetian composer is actually believed to have been written by his biographer, Remo Giazotto. His D minor oboe concerto was one of the first pieces of its type.
    ANSWER: Tomaso **Albinoni**
    [10] The frequently-excerpted adagio from this ballet depicts the title character cavorting with his lover, Phrygia. The Phantom Regiment show that won the 2008 Drum Corps International World Championship used this ballet's adagio as its main theme.
    ANSWER: *Spartacus* [or *Spartak*]

4.  The most general description of this phenomenon is given by the Kirchhoff integral. For 10 points each:
    [10] Name this phenomenon that may be described by the somewhat simpler Fresnel and Fraunhofer equations in the near-field and far-field cases, respectively.
    ANSWER: **diffraction**
    [10] Applying this operation to the electric field distribution at an aperture produces the Fraunhofer diffraction pattern. Applying this operation to the autocorrelation function of an optical signal gives its power spectrum by the Wiener-Khinchin theorem.
    ANSWER: **Fourier transform**
    [10] Plotting one of the Fresnel integrals on the real axis and the other on the imaginary axis produces this tool for graphical analysis of near-field diffraction.
    ANSWER: **Cornu spiral** [or **Euler spiral**; or **clothoid**]

5. During this event, the central participant was offered wine, honey, and milk, and chose the milk. For 10 points each:
[10] Name this event that consisted of two parts, the Isra and the Mir'aj, and took place with the aid of al-Bur'aq.
ANSWER: the **Night Journey** of Muhammad
[10] One of these objects called Sidrat al-Muntaha lay at the end of the seven heavens that Muhammad visited during the Night Journey. In the Qur'an, the Garden of Eden only contains one of these objects that grants eternal life and does not contain one that grants knowledge of good and evil.
ANSWER: **tree**
[10] On his way back from meeting with Allah, Muhammad passed by Moses in the sixth heaven and Moses recommended that he return to ask for this favor. Muhammad successfully made this request four times in a row.
ANSWER: **reducing the number of** daily **prayers** [accept descriptive equivalents]

6. This politician ordered the Santa Cruz massacre during an occupation opposed by FRETILIN. For 10 points each:
[10] Name this world leader who employed the Berkeley Mafia and called his government the New Order.
ANSWER: **Suharto**
[10] Suharto succeeded Sukarno as president of this country, which invaded East Timor in 1975.
ANSWER: **Indonesia**
[10] Suharto resigned as president after the *rupiah* plummeted in value as a result of this event, which began in Thailand when the *baht* collapsed in June 1997.
ANSWER: 1997 **Asian financial crisis** [or **Tom Yum Goong** crisis]

7. An instance of this phrase comes after the question, "Would she not have the advantage, after all?" and is followed by the speaker asking, "And should I have the right to smile?" For 10 points each:
[10] Name this manner in which "[t]his music is successful," according to T. S. Eliot's "Portrait of a Lady." Another speaker claims to hear the sound of this two-word phrase, "[b]eneath the music from a farther room."
ANSWER: a **dying fall**
[10] Eliot took the phrase "dying fall" from a speech in this play in which Duke Orsino states, "If music be the food of love, play on." This play also features characters like Sir Toby Belch and Malvolio.
ANSWER: *Twelfth Night, or What You Will*
[10] The epigraph of "Portrait of a Lady" comes from this other play, in which the friar Bernardine says, "Thou hast committed," but is interrupted by the title character, who states, "Fornication? / But that was in another country."
ANSWER: The *Jew of Malta*

8. The erratic scribblings of Doug Ratmann can be found in this facility, which created an entity that promises to give the player character cake in a room that actually contains an incinerator. For 10 points each:
[10] Identify this facility responsible for creating personality cores like Wheatley, who straps a former nemesis to a potato battery out of spite.
ANSWER: **Aperture** Science Enrichment Center [or **Aperture** Laboratories]
[10] Aperture Labs is the setting of this series of games in which Chell solves puzzles and navigates around GLaDOS' traps using her ability to spawn the title objects with her gun.
ANSWER: *Portal*
[10] In this other puzzle game, the player is spawned in a post-apocalyptic constructed reality run by an AI named ELOHIM. The player must collect sigils and has philosophical discussions with the Milton Library Assistant at computer terminals.
ANSWER: The *Talos Principle*

9. This field was founded by Clarence Irving Lewis, who introduced its systems S1 through S5, and his work was expanded by Ruth Marcus, who worked on the quantification of this field. For 10 points each:
[10] Identify this form of logic for which Saul Kripke would create his namesake "semantics."
ANSWER: **modal** logic
[10] While modal logic represents possibility with a triangle, this property is represented by a square. This property is paired with *Naming* in the title of a Saul Kripke work.
ANSWER: **necessity**
[10] Arthur Prior based this system of logic off of modal logic. This system's binary modal operators are "release" and "until," and this system is used to model properties in formal verification.
ANSWER: **temporal** logic [accept **tense** logic]

10. A "covert" variant of this operation is sometimes posited at LF for Mandarin Chinese, which leaves its question words in their base-generated positions. For 10 points each:
[10] When it occurs in the root clause, this phenomenon results in English sentences that begin with words like "what" or "where," and this operation cannot take place out of extraction islands. It is named for the class of words that it applies to.
ANSWER: **Wh-movement**
[10] Wh-movement appears to take place in these clauses, like "what you're selling" in the sentence "I'll buy what you're selling," but Bresnan and Grimshaw argued in 1978 that a different operation was required. They contrast with a similar "bound" clause type.
ANSWER: **free relative** clauses
[10] A-bar movement is an example of this kind of operation that is fundamental to the Chomskyan tradition of generative syntax. These operations produce a surface structure from a deep structure.
ANSWER: **transformation**s

11. This theorem was proved alongside Thurston's geometrization conjecture. For 10 points each:
[10] Name this theorem that states that every simply connected, closed 3-manifold is homeomorphic to the 3-sphere. This is the only Millennium Prize problem that has been solved.
ANSWER: **Poincaré** conjecture
[10] Grigori Perelman's proof of the Poincaré conjecture uses this process "with surgery," which removes singularities. This process deforms the metric of a Riemannian manifold using a partial differential equation similar to the heat equation.
ANSWER: **Ricci flow**
[10] The generalized Poincaré conjecture asks if an n-manifold that has this relation to the n-sphere is also homeomorphic to the n-sphere. This relationship occurs between two spaces $X$ and $Y$ if there exist continuous maps $f$ and $g$ such that $f$ of $g$ and $g$ of $f$ can be continuously deformed into the identity maps of $X$ and $Y$, respectively.
ANSWER: **homotopy equivalence** [or **homotopy equivalent**; accept answers like "they're of the **same homotopy type**"; do not accept or prompt on "homotopy" alone or its word forms]

12. This book argues that the blackbird is "the only element in nature which is aesthetically compatible with bleak light and bare limbs" in its analysis of "Thirteen Ways of Looking at a Blackbird." For 10 points each:
[10] Name this book of literary criticism by Helen Vendler that analyzes the longer poems of a certain author. This book's discussion of "The Man with the Blue Guitar" is titled, "A Duet with the Undertaker."
ANSWER: *On Extended Wings*
[10] The poems discussed in *On Extended Wings* were all written by this man, who wrote that "Death is the mother of beauty" in "Sunday Morning."
ANSWER: Wallace **Stevens**
[10] In this poem, Stevens wrote that "the windy sky cries out a literate despair." It opens, "Children picking up our bones will never know that these were once as quick as foxes on the hill" and describes an abandoned mansion.
ANSWER: "A **Postcard from the Volcano**"

13. All of this man's sons, except Licymnius, died fighting off the cattle raid of Pterelaus, the king of the Taphians, but the cattle were sold to Polyxenus of Elis and had to be ransomed by this man's son-in-law. For 10 points each:
[10] Name this son of Perseus who was accidentally killed by Amphitryon when the latter's club bounced off a cow and hit this man on the head. He was the father of Alcmene.
ANSWER: **Electryon**
[10] Creon agreed to help Amphitryon in a war if he could kill the Teumessian one of these animals, which had the property that it could never be caught. Amphitryon tried to use the unfailing hound Laelaps, creating a paradox.
ANSWER: Teumessian **fox**
[10] Laelaps was originally a gift from Zeus to this woman, a Phoenician princess whom Zeus had kidnapped while in the form of a bull. The kings of Crete were descended from her.
ANSWER: **Europa**

14. This linear variational method includes all Slater determinants of the correct symmetry and is capable of providing an exact solution to the time-independent, non-relativistic Schrödinger equation. For 10 points each:
[10] Name this very expensive method in computational chemistry. Davidson has developed a correction that allows for estimations of the energy that would be obtained in this method.
ANSWER: **full configuration interaction** [or **full CI**; prompt on **c**onfiguration **i**nteraction]
[10] Full CI will provide numerically exact answers in the limit of an infinitely flexible and complete one of these constructs, a set of functions used to build molecular orbitals. Common examples include Pople's 6-31G and Alrich's TZVP.
ANSWER: **basis set**s
[10] Many modern basis sets use linear combinations of this kind of function to represent molecular orbitals. This function also gives its name to a widely used computational chemistry software package developed by Pople, and is used to describe a normal distribution in statistics.
ANSWER: **Gaussian**

15. This artist's *Crucifixion Diptych* shows St. John the Evangelist supporting a collapsing Mary on the left and Christ on the cross at right, uniting the two panels with a continuous gray wall and recurring red cloth. For 10 points each:
[10] Name this Flemish painter whose best-known work, *The Descent from the Cross*, contains numerous images of crossbows to indicate that the work was commissioned by Leuven's archers' guild.
ANSWER: Rogier **van der Weyden**
[10] A small wood carving of Adam and Eve appears at the left of this van der Weyden work in which a saint in red robes is engaged in silverpoint while kneeling before Mary, who is breastfeeding.
ANSWER: *St. Luke Drawing the Virgin* [accept alternate wordings]
[10] The triple arch that looks out onto a garden, loggia, and river winding through a cityscape are present in both *St. Luke Drawing the Virgin* and this artist's *Madonna of Chancellor Rolin*. This man painted the *Ghent Altarpiece*.
ANSWER: Jan **van Eyck**

16. While living in a boarding house in his youth, this man shared his bed with a cabin boy named Dick Heaton until he saw "two tumours on his breast" and realized Dick was a girl named Alice. For 10 points each:
[10] Name this Welsh explorer who deserted from both sides of the American Civil War years before he traveled to Lake Tanganyika and asked his most famous question, "Dr. Livingstone, I presume?"
ANSWER: Henry Morton **Stanley** [accept John **Rowlands**]
[10] Stanley led a relief expedition through "darkest Africa" in support of this governor of Equatoria, the successor of Charles Gordon. The expedition to relieve this man involved one of the first uses of the Maxim gun.
ANSWER: **Emin Pasha**
[10] This officer in the Emin Pasha Relief Expedition later gained fame for racing to Katanga in order to claim that region for the Congo Free State. This man won that race against Cecil Rhodes' British South Africa Company.
ANSWER: William Grant **Stairs**

17. This woman helped organize the Peasant Unity Committee after her father was jailed for standing up to wealthy *ladino* landowners. For 10 points each:
[10] Name this Mayan activist who recounted her life in a 1983 biography transcribed by Elizabeth Burgos-Debray. She received the 1992 Nobel Peace Prize despite David Stoll's allegations that her book contained several lies.
ANSWER: Rigoberta **Menchu** Tum [accept *I, Rigoberta **Menchu***]
[10] In his book on Rigoberta Menchu, Stoll criticized academics for romanticizing Latin American radicals like this man. He wrote about his travels in South America as a young man in *The Motorcycle Diaries*.
ANSWER: Ernesto "Che" **Guevara**
[10] This Polish writer criticized the Marxist MPLA in his book about the Angolan Civil War, *Another Day of Life*. This journalist also wrote a study of Ethiopia under Haile Selassie, *The Emperor*, and a memoir that relates his experiences to those of his favorite historian, *Travels with Herodotus*.
ANSWER: Ryszard **Kapuscinski**

18. Answer some questions about pseudogenes, for 10 points each:
[10] In some cases, genes can become pseudogenes due to mutation or deletion of these vital genomic regions that bind RNA polymerase and initiate transcription. The TATA and Pribnow boxes are often found in these regions.
ANSWER: **promoter**s
[10] KLRAP1, the gene for the human analogue of Ly-49, is transcribed successfully but loses its mRNA transcript via this process. This process, a type of mRNA surveillance, is facilitated by the exon junction complex and the SURF complex, and it deletes transcripts with a namesake mutation.
ANSWER: **nonsense-mediated decay** [or **NMD**]
[10] Due to a nonsense mutation, the wild-type gene for type 12 in this protein family is truncated and nonfunctional, making it a pseudogene; populations with the functional version are more vulnerable to sepsis. Type 8 in this family is activated by Fas receptors via FADD.
ANSWER: **caspase**s

19. The participants in these events had their hands joined by a *pronuba* and said to each other either "Ubi tu Gaius ego Gaia," or "Ubi tu Gaia, ego Gaius." For 10 points each:
[10] Name these events at which a Herculean knot was tied on a woman's belt, to be untied after these ceremonies were concluded. Elagabalus scandalously participated in one of these events with a Vestal Virgin.
ANSWER: Roman **wedding** [accept equivalents]
[10] Under the *cum manu* form of marriage, the wife entered into the legal control of her husband, meaning that she would be free from her father's control, denoted by this two-word Latin term.
ANSWER: *patria potestas*
[10] Terentia, the wife of Cicero, married two more times after their divorce. One was to Marcus Valerius Messalla Corvinus, while the other was to this historian of *Catiline's Conspiracy* and *The Jugurthine War*.
ANSWER: **Sallust** [or Gaius **Sallust**ius Crispus]

20. In this film, the camera pans over a diorama of Mexican pyramids populated by bearded lizards dressed in colorful Aztec costumes, before men wheel in three carts full of toads in conquistador costumes. For 10 points each:
[10] Name this surreal tarot-inspired film by Alejandro Jodorowsky in which the Alchemist leads a group of people to the title location, where cloaked men whom they believe hold the secret to immortality are revealed to be dummies.
ANSWER: The *Holy Mountain*
[10] Jodorowsky tried to adapt this novel into a 14-hour film for which Salvador Dalí wanted to be paid $100,000 an hour, but ultimately failed, as documented in a Frank Pavich film. David Lynch actually did adapt it in 1984.
ANSWER: *Dune*
[10] In this 2001 David Lynch film titled for a road in Los Angeles, an aspiring actress named Betty Elms befriends a woman who claims to be "Rita." This surreal film features a scene set at Club Silencio and a mysterious blue key.
ANSWER: *Mulholland Dr.*